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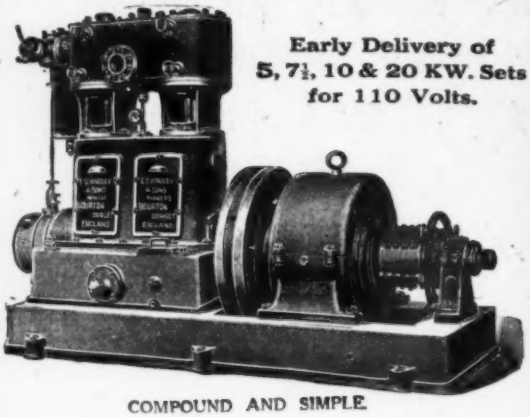

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THE

ELECTRICAL REVIEW.

VOL. LXXXIX. NOVEMBER 11, 1921. No. 2,294.

ELECTRICAL REVIEW.

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THE I.E.E. PRESIDENTIAL ADDRESS.

THE Institution of Electrical Engineers, amongst its many other excellent features, is distinguished by the uniformly high standard attained by its successive Presidents in their inaugural addresses; these are invariably interesting and instructive, and sometimes even epoch-making. The address which Mr. J. S. Highfield delivered on Thursday last week was no exception to this rule; it touched upon a wide range of subjects, and illuminated every topic that was dealt with.

Naturally, the acquisition of the Royal Charter was given prominence at an early stage in the Address, and in leading up to this the President justly emphasised the merits of the constitution which has been slowly evolved by the Institution—a constitution which is a model of its kind, and which, we believe, is far in advance of that of any other Institution of similar standing and composition, combining, as it does, the advantages of centralised government with the largest possible measure of local autonomy and responsibility. The Institution rests upon the broad foundation of its Territorial Centres and their Sub-Centres, each a focus of activity, and all contributing to the common good of the Institution as a whole; the system has succeeded well in the past, but we believe its possibilities are far from being exhausted. The main theme, however, of the address was the meaning and rightful use of "profit," a term which, as Mr. Highfield remarked, had been misunderstood and misapplied by many who made use of it; it was discussed in its relation to the individual, to the public company, to the municipality, and inferentially to the nation as a whole. It may be news to many outside the circle of Mr. Highfield's more intimate acquaintances that while he is best known as a successful engineer, he has also made a special study of the commercial problems with which engineering is almost always inseparably associated, and is thus enabled to pierce through the mists of popular prejudice and to see clearly the principles of sound finance in their true bearings. But he takes a far broader view of the subject than to restrict it to finance and commerce; he applies its doctrines to life itself, and thus he treated at length of education, to which he attached the greatest importance (the right kind of education, of course), especially emphasising the necessity of imparting skill in some art or other to the learner. By "education" Mr. Highfield denotes "all up-bringing, the formation of character, the means of health both of body and mind, the Christian virtues, the love of work, the need of service, and the sacrifice, called duty, that alone should win us rights"—a happy summary of qualities which can be acquired only when the individual makes a "profit."

To this end Mr. Highfield lustily attacked that unfortunate policy of the trade unions which turns a blind eye to merit and ability, and ordains that all men in the same category shall be paid alike; he claimed that every man should be free to work as skilfully and as hard as he liked, and to attain a due reward for his labour—a claim which we cordially endorse.

Turning to the more ordinary and narrower use of the term "profit," Mr. Highfield treated the subject in masterly fashion, showing how, for instance, the business of electricity supply should be conducted on sound lines, whether in private hands or in those of a municipality. We are pleased to see that in Mr. Highfield's opinion, after all due allowances have been made and a reasonable dividend has been paid on the ordinary

shares of a company, any sum that is left over may be called profit, and "should be employed equally to benefit those who direct and work the business, the shareholders who bear the risk, the consumer by way of a reduction in price, and lastly, some share for the business itself"—the last-named portion being available for research in new methods and in new ventures. The importance of making a profit, which is essential to progress, was strongly emphasised, and Mr. Highfield deplored the attitude of mind which, by placing obstacles in the path of private enterprise in the past, had delayed the development of electricity supply in this country. On the other hand, he showed that the advantages enjoyed by municipalities in raising money were largely neutralised by the necessity of providing for repayment of loans and reserve. Some companies and municipalities had misused their profits, the former by paying too high dividends, and the latter by distributing the profits in the form of relief to the rates.

Mr. Highfield struck a responsive note when he said that "progress in electricity supply rests first on a general determination to cease talking and to get to work." Whilst expressing confidence in the Electricity Commissioners, he regretted that they had been burdened with executive duties, and uttered a broad hint that they were showing symptoms of suffering from the red-tape disease which is so highly contagious in Government departments. In order to speed up progress, he urged that the prevalent feeling of uncertainty as to the future created by the Act of 1919 should be dispelled by clear proof that the existing rights of companies and municipalities would be respected—a policy with which we most heartily agree—and that both parties should join hands in promoting the development of electricity supply, thus endorsing the exhortation of Major Richardson at the last I.M.E.A. conference, which we welcomed at the time. Lastly, Mr. Highfield made the revolutionary suggestion that the purchase clause in Provisional Orders should be abrogated: "No single change would do more to promote enterprise and to supply the public at the least cost." Unhappily this can be done only by consent of the municipalities, and we fear it is hardly within the scope of practical politics.

In this brief review we have touched only a few points of the President's interesting and stimulating address: it is replete with original and fertilising ideas, and should be read by all who belong to the electrical industry.

The Urgent Need for Postal Rates Reform.

If the Postmaster-General and the Government seriously regard the high postage rates as a handicap to the efforts of those who are working to bring about, or to accelerate the rate of, trade revival, it is surely the height of folly to allow the halter to hang about the neck of industry one day longer than is absolutely necessary. The Postmaster-General has recognised the unpopularity of the high rates which were introduced before trade depression had gone so far as it has recently done, but apparently all he can do is to hold out hope of a modification at the end of the financial year. We would re-echo the question of *The Times*: "Why wait till March?" and would strongly support the view of Lord Blyth, who says that modification six months hence is not sufficient, and who calls for the revocation of the recent imposts "root and branch" forthwith. The higher rates for letter post at home, for printed matter, and for foreign letters, and the obstruction put in the path of the free flow of correspondence and trade by the stoppage of the Sunday collection and delivery, are, considered from the national trade development standpoint, false economy, penny wise and pound foolish. At a time when we require to avail ourselves of every means at our disposal which forms a legitimate vehicle for the circulation of British trade propaganda—the distribution of trade journals, catalogues, price lists, and other literature, and the free flow of correspondence both at home and in the markets abroad where we are seeking business—the leash held by the Postmaster-General should be released, and the manufacturer and the merchant should be encouraged instead of obstructed. As Lord Blyth points out, cheap postage is wholly productive "and its adoption would assuredly yield to our people ever-increasing millions in ever-expanding trade." The Association of Chambers of Commerce discussed the subject at Sheffield, and urged by resolution that the Post Office direct its efforts to the cheapening of the letter post and the parcel post and postcards and the telegraphic and telephonic services, and to other means whereby manufacturers and merchants would be materially assisted in the re-establishment of trade, "in view of the existing financial state of the country." Mr. W. H. Burchell, in a very telling letter to *The Times* reviewing the position from the point of view of unemployment, says that the master printers of the United Kingdom and 544 heads of leading London industrial firms are convinced that if the P.M.G. could be induced immediately to re-establish the halfpenny postal rate on printed matter he would have cleared up at least one phase of the unemployment question. He remarks that every week of delay means a loss of £500,000 to labour or £26,000,000 per annum! But we need not quote more authorities, for the trading and industrial communities are unanimous in the conviction that the revenue that the State may gain by maintaining the recent increases will be lost many times over immediately by unemployment due to the existence of the handicap, and that we shall permanently lose to foreign rivals business which ought to provide our people with bread for years to come. Government control of industry and trade is a throttling influence, while spoon-fed industries are unlikely to be sound and progressive, but there is a legitimate sphere within which the Government can operate, giving real and permanent encouragement to national trade. It has no more powerful weapon to put into the hands of industry than the cheapest means of communication, internal, between the people of these islands, and external, between ourselves and our kith and kin and all the dwellers abroad who are potential purchasers of our manufactured products—cheap transmission of letters and parcels, of trade journals (alias trade-getters), and of catalogues and price lists; and cheap transmission of telegraphic and telephonic messages everywhere.

Electrical Fires.

Under this heading our contemporary *The Engineer*, in its issue of October 14th, moralises over the recent fire at the Grands Magasins au Printemps at Paris. As might be safely expected with regard to this or any other considerable fire, the outbreak has been ascribed to "the fusing of an electric wire." We sometimes wonder what was the stock phrase in, say, 1850. In 1666, of course, it was "Papists," and no doubt every age has had its catchword.

The part of the article with which we are hardly inclined to agree is that in which the remark is made that "the use of a pressure such as 50 volts is, of course, now out of the question." If it is meant—it is not quite clear—that such a pressure as 50 volts is out of the question for the street mains, we agree; but if, as the context seems to require, the internal wiring is meant, then we are of the opinion that Silvanus Thompson was right in saying, years ago, that 50 or 100 volts was much better than a higher pressure so far as the consumer was concerned. Now that the current flowing has been cut down, by the use of tungsten lamps, to about a quarter of what it was in the carbon lamp days, it is a matter of some difficulty, if any recognised wiring rules are observed, to wire a house with cable that is likely to be overloaded; so that if a supply at 200 volts is transformed down to 50 volts, the situation is no worse than it would have been a dozen or so years ago, with carbon lamps, at the higher voltage.

That 50 volts is intrinsically safer as regards fire risk than 200 volts is open to question, because there is so little risk, with modern materials and apparatus (and assuming the fuses to be of small size) at 200 volts, that it can hardly be less at any lower pressure. The chief advantages are that smaller and more efficient light units can be used, the lamps have a longer life, and the wiring and fittings can be of cheaper quality.

For heating and cooking appliances, 200 volts is a very satisfactory pressure; since the current required is fairly considerable, it is desirable that the pressure shall be reasonably high. There is much to be said, however, for a pressure of 100 volts. That this is ample for electric cooking has been fully demonstrated by the long experience of the Brompton & Kensington Electric Supply Co., which, as we recently noted, has 500 electric cookers on its mains and supplies them at 100 volts, a.c., with complete satisfaction. Referring to this network, Mr. A. Page, one of the Electricity Commissioners, said that, in view of modern developments, it might very well turn out that other electricity suppliers would have to adopt the system which, in the hands of that company, had proved to be so elastic and convenient, enabling heavy domestic loads to be carried with comparatively light feeders. That is practically the system which we favoured in our issue of September 17th, 1920—namely, the multiplication of street transformers, supplied at 3,000 or 5,000 volts, with short low-pressure distributors. In the same issue Mr. C. H. Wordingham warmly advocated the reversion to a utilisation pressure of 100 or even 50 volts.

Where a supply can be given at 100 or 110 volts, we think that would afford the most satisfactory solution of the problem; but where a supply pressure of 200 to 240 volts is already in vogue it would seem that, from the consumer's point of view—and we see no inherent disadvantage so far as the supplier is concerned—the best course would be to use that pressure for heating and cooking, with a small compensator or auto-coil, taking about 3 watts to excite, reducing the lighting voltage to 50. The use of house-to-house transformers is not thereby rendered necessary, metering problems are not made more difficult, and it appears to enable the best service to be obtained from the supply available.

Electrical Salesmanship.

We are sure that commercial men connected with various branches of the electrical industry will be eager to avail themselves of the electrical salesmanship conferences that are being organised tentatively this season by the British Electrical Development Association. Their opportunities for discussing purely commercial matters connected with their work have not been very numerous in the past, for they have had no special organisation to look after their interests in this respect; many of them not being technical or only semi-technical men have not attached themselves to the Institution of Electrical Engineers. The latter body nowadays commendably devotes more attention to industrial affairs than ever it did in the past, and in its informal meetings it has provided the opportunity required by the more commercially-minded among its members to get together fraternally and conversationally. But the effort of the B.E.D.A., while enabling these to take part in the new conferences, will especially cater to the at present unmet requirements of the unattached commercial electrical man. The latter, as an individual, and his class as a whole, have a most important place to fill in present measures for giving a new impetus to electrical progress. That, after all, is the main purpose of the Electrical *Development* Association. Much remains to be done in popularising the uses of electricity and in presenting the advantages of electrification to the consuming public, and we feel that the series of informal electrical salesmanship conferences arranged to that end, and of which particulars appear on a later page, are thoroughly well worthy of support from our commercial readers.

We wish the movement complete success, because it is in the interests of the industry, and cannot fail to eventuate in better service from, and greater reward to, a class of men who, well informed and properly encouraged, are able to hasten progress.

A Case for Industrial Credit.

To the British exporter of general merchandise New Zealand is one of the most attractive of our Dominion markets. Competition from local manufacturers has scarcely yet seriously affected sales from the old country, whilst foreign rivals have in few instances succeeded in supplanting British goods in face of the patriotic preference for them which has been consistently displayed by New Zealand purchasers. This goodwill is of special interest just now to the British exporter of engineering material, in view of the electrical developments which are taking place in the Dominion. That Britain must not cease to justify the preference shown to her is urged again by H.M. Trade Commissioner in New Zealand (Mr. R. W. Dalton) in the report which has recently been issued by the Department of Overseas Trade and is summarised on another page. The market needs nursing at present for more than one reason. Tariff revision is under consideration and, it is said, will follow the lines adopted in Australia. This signifies that every effort will be made by means of protective duties to foster the growth of local manufacture. Such a programme should certainly not be less successful in New Zealand than in the Commonwealth, in view of the advantage possessed by the former in its sources of cheap water-power. British manufacturers should endeavour to participate in this movement by the supply of the necessary skilled supervision, equipment, and semi-manufactured products. There is yet time, for the Dominion, like every other country, is still suffering from excessive stocks of imported goods and depreciated prices of its exports. The need for economy is likely to lead to the postponement of a portion of the hydro-electric programme. Yet the prospects of a return to normal trade are probably brighter in New Zealand than in most other countries. Meanwhile, if the early realisation of New Zealand's full scheme of hydro-electric generation would lead to contracts for British industry, there seems a good case for a loan under Mr. Lloyd George's new scheme of credits for productive works.

The West Riding Decision.

The decision of the Electricity Commissioners in respect of the West Riding Electricity District, which has been awaited for five months, was issued last week, and is reported in our pages to-day.

In view of the clash of interests which was manifested at the Inquiry, it was obvious that none of the schemes that were put forward would or could be adopted as a basis for the reorganisation of the supply of electricity in the District; hence the Commissioners have cut the knot by dividing the District into two areas, to be defined by agreement, one to be dealt with by the leading municipalities, whose power stations will be interconnected, and the other to be supplied by the Yorkshire Electric Power Co. A Joint Electricity Authority will be formed for the whole District, on which all parties will be represented, which will control the operation of the interconnected stations, and, in consultation with an Advisory Committee of municipal electrical engineers on the one hand, and with the Power Co. on the other, will supervise the conduct and development of electricity supply throughout the area.

The scheme as now promulgated appears to us to afford a very satisfactory solution of a difficult problem—a give-and-take solution, in which neither the municipalities nor the private undertakers have secured all that they could wish, but which, to our mind, should enable them all to carry on to great advantage, and which presents them with an ideal opportunity to practise that co-operation which is essential to the welfare of the various undertakers and of the community at large.

ELECTRICITY SUPPLY AT SHEFFIELD.

The Blackburn Meadows Generating Station.

(*Concluded from page* 606.)

With regard to the stokers, these are of the Bennis chain-grate type, and each boiler has two grates 14 ft. long by 7 ft. wide, which gives a total furnace area of 196 sq. ft. per boiler. The stokers are belt driven by means of a central line of shafting which is carried by the underside of the bunkers and runs the full length of the boiler house. The main line driving shaft is divided into two sections, and a driving motor is located at each end as well as in the middle; the 45-h.p. motors drive the shaft by means of a chain speed-reducing gear of the Hans Renold block type enclosed in dust-proof steel casing. The stoker drive is from the main shaft to small counter-shafts which are located on the tops of the stokers, and thence by means of short belts that drive the six-speed gear with which the grates are provided. As the whole of the main shafting can be driven by either of the three motors it will be realised that ample allowance has been made for any breakdowns that may occur or overhaul that may be required at this important point of the plant. There are seven steel chimneys, one to each pair of boilers, which were supplied by Messrs. J. Thompson, of Birmingham, and have a diameter of 12 ft. at their base, 8 ft. at the top, and a height of 60 ft. To each stack is connected two 45-in. induced draught fans of the Sirocco type, and fig. 8 shows eight of the 14 sets that were supplied by Messrs. Davidson & Co., Ltd., of Belfast. Each fan is capable of creating a draught equal to 2.5 in. water gauge at the inlet, and is direct driven at a speed of 480 r.p.m. by a 40-h.p. Crompton motor.

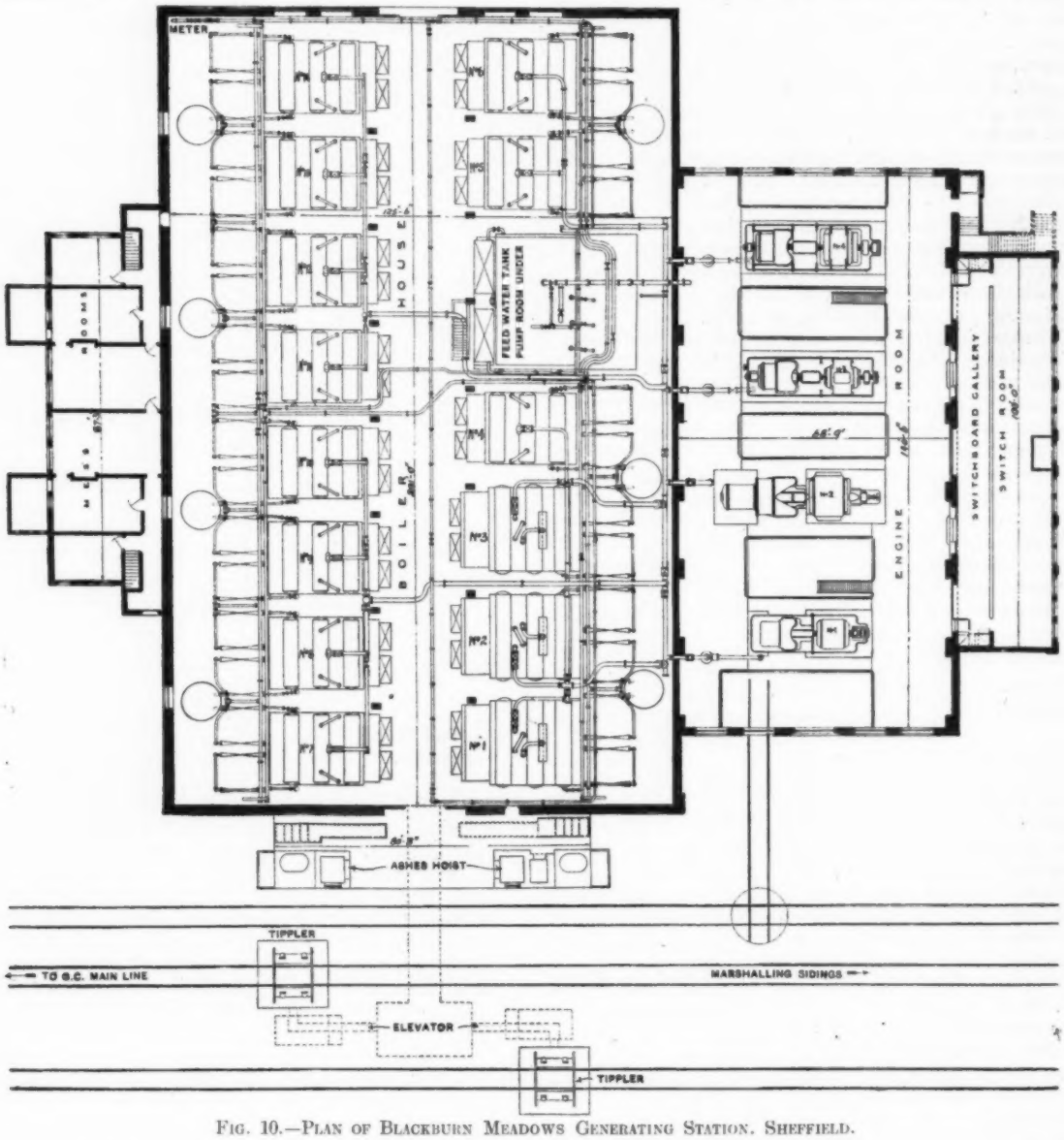


Fig. 10.—Plan of Blackburn Meadows Generating Station, Sheffield.

The boiler ash and clinker fall over the back end of the grate on to a dumping plate formed by the sector of a circle of cast iron. At intervals as found necessary the accumulated ashes are released and fall into a pit from which they are fed to a Babcock & Wilcox ash crusher that is driven by an E.C.C. 10-h.p. motor, fig. 9. The photograph from which this illustration was reproduced was taken without the aid of any artificial illumination whatever, and conveys a good idea of the spacious and well lighted boiler-house basement. The crusher travels on rails, and is moved by hand from boiler to boiler as may be required. It delivers the

crushed ash into cast-iron suction pipes, 8 in. in diameter, laid along the basement floor, which terminate in receiving tanks located at the south end of the boiler house at a height of 55 ft. The ash is drawn into these receivers by means of two sets of Roots blower air exhausters which are driven by 70-h.p. motors. The whole of the ashes and dust are slaked by means of water sprays at the inlet to the receiver tanks; in connection with this plant special pumps draw water from the circulating water inlet for the purpose of slaking in the receiver and for cleansing the foul air which passes along the pipes as it is passed through the filters into the exhausters, and before it is discharged to the atmosphere through silencers. Connected to the same exhausters is a second set of 6-in. pipes that are used to remove all the soot and grit from between the bottom

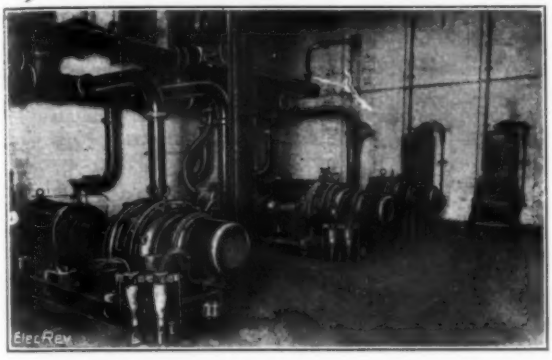


Fig. 11.—Boiler-feed Pump Room.

drums of the boilers and also from the bottom of the economisers; thus the flues are kept clean whilst in service. The capacity of each receiver is 14 tons of ash, which is discharged through a valve at the bottom into reinforced concrete hoppers; valves and shoots are fitted to the latter to convey the ash into railway trucks. Two separate sets of suction ash plant were supplied by Messrs. E. Bennis & Co., Ltd., of Bolton, each row of boilers being served by one set, and in the event of any dislocation of the plant the necessary stand-by is provided in the form of steel tipping wagons that travel on the same rails as the ash crusher. The wagons can be elevated by means of electric hoists which are so arranged that they cannot be operated unless the wagons are locked in position; on the arrival of a wagon at the top it is automatically tipped into the concrete hoppers.

The engine room contains four steam turbines on a level with the boiler house firing floor; they give a combined normal output of 37,500 h.p., and each machine is direct coupled by means of a flexible coupling to a 3-phase, 50-cycle generator, which generates energy at a pressure of 6,600 volts. The generators have a combined capacity of 35,000 kVA. The four sets of plant are of the following sizes and types:—

No. 1 consists of a Curtis 8,000-h.p. turbine and a 7,500-kVA alternator running at a speed of 1,500 r.p.m. and both of the British Thomson-Houston Co.'s manufacture. Fans are fitted on the alternator rotor, and the quantity of air that is required to be passed through the machine for cooling purposes is 33,000 cu. ft. per minute. The condenser and air pumps for this set were manufactured by Messrs. Cole, Marchent & Morley, of Bradford; the former's 12,000 sq. ft. of cooling surface is capable of condensing 90,000 lb. of steam per hour. The three-throw Edwards air pump has plungers 24 in. in diameter, a stroke of 14 in., and is driven at a speed of 110 r.p.m. by a 40-h.p. motor which runs at 600 r.p.m. The 24-in. centrifugal circulating pump is direct driven by a 200-h.p. motor at a speed of 565 r.p.m., and pumps an average of 576,000 gallons of water through the condenser per hour.

No. 2 machine was supplied by Messrs. C. A. Parsons and Co., and comprises a single-cylinder, pure reaction, 13,500-h.p. turbine and a 12,500-kVA alternator operating at a speed of 1,500 r.p.m. The condenser, which provides 14,000 sq. ft. of cooling surface, is capable of dealing with 120,000 lb. of steam per hour, and all the moving parts of the Edwards direct-acting air pump are totally enclosed. The buckets are 22 in. in diameter with a 10-in. stroke, and will extract 620 cu. ft. of air per minute. This pump is driven through helical reducing gears at a speed of 95 r.p.m. The 30-in. centrifugal circulating pump will deliver a total of 978,000 gallons of cooling water per hour through the condenser, and is of the Gwynne twin type. These pumps are arranged to be driven by a small steam turbine, or as an alternative, a 250-h.p. motor that runs at 480 r.p.m. is provided to drive these auxiliaries, an illustration of which is given in fig. 3. Attached to this set is a 110-h.p. motor driving a separate fan which provides the cooling air that is required by the alternator.

Nos. 3 and 4 machines were supplied by the English Electric Co., Ltd., and are composed of Zoelly impulse turbines, each producing 8,000 h.p. at a speed of 3,000 r.p.m. and direct coupled to General Electric Co.'s 7,500-kVA alternators. On the generator rotor shafts fans are fitted which deliver approximately 33,000 cu. ft. of cooling air per minute to each machine. Each condenser contains 10,500 sq. ft. of cooling surface and deals with 90,000 lb. of steam per hour, while each centrifugal circulating pump will deliver 438,000 gallons of cooling water per hour against a 53-ft. head. The pumps are 24 in. in diameter, and each is direct driven at 960 r.p.m. by a 175-h.p. motor. Each three-throw Edwards air pump is driven at a speed of 100 r.p.m. by a 20-h.p. motor through a spur reduction gear, and is 19 in. in diameter with a stroke of 11 in.

Each set of plant is provided with a Lea water meter which gives a continual record of the actual steam consumption of the turbine at all loads. The condensed steam is pumped up to the main boiler feed-water tank by means of a small force pump that is coupled to the crankshaft of the air pumps; thus all the heat units in the condensate are utilised. Each generator is coupled direct to three single-phase transformers which are delta coupled on the machine side and star connected on the outgoing busbar side. These transformers,

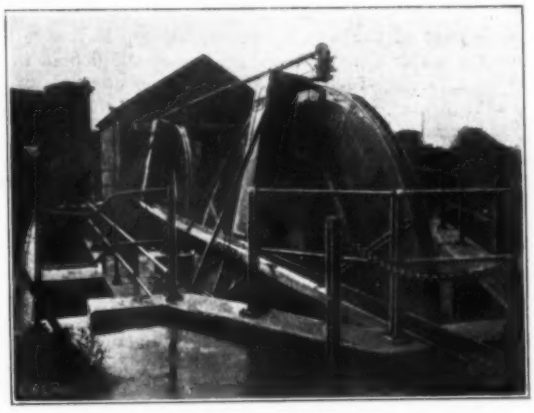


Fig. 12.—Circulating Water Screens.

which were supplied by the British Electric Transformer Co., of Hayes, and are illustrated in fig. 4, step up the generated pressure of 6,600 volts to 11,200 volts on the main busbars. The generators are protected by means of overload relays in conjunction with the Merz-Price balanced current system.

The main switchboard is located on a slightly raised gallery which runs along the whole length of the east side of the turbine room. As will be seen from fig. 5, the switch handles, meters, and other instruments are mounted on switchplates on the front of a substantial glazed brick wall, and the operator is thus effectively separated from any part of the main switch mechanism that is under pressure. The four generator panels, which are fitted with exciter switchgear, are placed at the centre of the board, from which position the operator

can obtain a full view of all the four sets of plant. The remainder of the board is made up of ten split conductor feeder panels, three transformer panels, and one Blackburn Meadows-Neepsend interconnector panel. Behind this brick switchboard is the main switch room, an interior view which is given in fig. 6. It contains ironclad totally-enclosed gear manufactured by Messrs. Reyrolle & Co.

The auxiliary switchboards are also of the Reyrolle ironclad pattern, and are placed along the west wall of the turbine room. They control all the motor-driven auxiliary plant in the station, and are so arranged that the motors driving the various sets of auxiliary plant derive their energy from their own respective turbo-generators; alternatively, any part of the auxiliary plant can be run from any one of the four generators, which arrangement is effected by means of an automatic throw-over switch on the auxiliary board. All the auxiliary plant throughout the station is operated at a pressure of 440 volts by means of 3-phase, 50-cycle energy, the various motors being of the Metropolitan-Vickers, B.T.H., or Crompton types. All the cables used in the station were supplied by Messrs. W. T. Glover & Co., Ltd.

The condenser circulating water flows in by gravity from a point just below the junction of the South Yorkshire Navigation Canal and the river Don, and passes through two continuously revolving screens made by Messrs. F. W. Brackett & Co., of Colchester. They are each 20 ft. 4 in. in diameter and have a $\frac{3}{8}$-in. mesh;

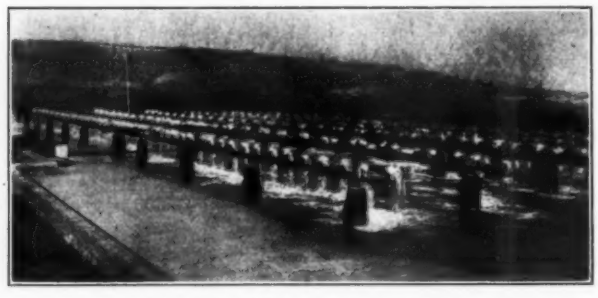


Fig. 13.—Water Cooling Sprays.

as each part of the screen reaches the top it is met by a reverse water spray which washes off all debris that may be adhering to it, the debris being carried away by a separate channel. Fig. 12 shows the screens, which are each revolved by a 6-h.p. Crompton motor, and may be driven at varying speeds so as to deal with the changing quantity of solid matter floating down stream. The two pumps that supply the washing sprays are driven by 12-h.p. Crompton motors.

A grating is located at the back of the screens, and behind this a circular penstock 54 in. in diameter forms the entrance to the 4 ft. 6 in. brick culvert which conveys the water a distance of 290 yards to the station. Another 54-in. circular penstock is provided immediately before the water enters the 7-ft. suction culvert; the two penstocks allow of separate parts of the culvert being closed from the river inlet for the purpose of cleaning, &c. The circulating pumps draw their water from the suction culvert, and the discharge from the condensers passes through a 40-in. cast-iron pipe to a spray cooling pond which has a total superficial area of 61,500 sq. ft. From the discharge main the water is distributed by means of 30 pipes which are fitted with 780 spray nozzles, as shown in fig. 13.

All the circulating pipes were supplied by the Staveley Coal & Iron Co., and the cooling plant by Messrs. Harrison, Son & Jobson, of Middlesbrough. The latter was designed to deal with 1,111,000 gallons of water per hour, cooling it down from 100 to 80 deg. F. with the atmosphere at 60 deg. F. and a humidity of 75 per cent. Any section of the distributor pipes can be cut off independently of the remaining parts, and after being cooled the water flows over a sill into a return culvert, from which it can be conveyed a distance of 350 yards back into the river, which it enters about 100 yards below the inlet, or alternatively, part or the whole of it can be returned to the suction culvert for re-use.

In conclusion, it remains to be said that up-to-date mess rooms have been erected for the use of the boiler house employés as a single-storey annexe to and on the west side of the boiler house. On the east side of the turbine house (the turbine floor being 19 ft. above the condenser floor on the ground level) a three-storey annexe has been built; the ground floor forms the fitting and repair shop containing the necessary tools, &c., for repairs and maintenance purposes, while the first floor over the workshops contains offices for the resident engineer and staff as well as mess-room accommodation for the employés engaged in the turbine house and switch room. For convenience and rapid ascent to all floors of the station, including the top of the coal bunker, a passenger lift has been installed at the south end of the boiler house.

Finally, we have to thank Mr. Fedden for permitting the publication of the particulars set out above, and also Mr. Wilson, superintending engineer at Blackburn Meadows, for facilitating the taking of photographs, &c., at the time of our visit to the station.

The Opening Ceremony.

The new station was formally opened by H.R.H. the Duke of York, on Friday last week, in the presence of a large and distinguished company. Mr. S. E. Fedden, chief engineer and general manager of the department and designer of the new station, presented the Prince with a knife of Sheffield make with which he cut a length of tape that had been stretched across the main entrance. The Prince then entered the building, and when he had inspected the plant and machinery, the Lord Mayor of Sheffield (Ald. W. F. Wardley) offered him their warmest welcome on his first visit to Sheffield. The city, with its population of half a million people, was the home of the steel industry, and needed, above all, an abundant supply of cheap electricity. The Corporation had endeavoured to give that supply, and its electricity undertaking had made gratifying progress with the capable and efficient help of the Electricity Supply Committee and their general manager. Personally he was hopeful that before long they would be able to introduce electricity into the homes of the working people, and to give them the benefits of lighting by electricity and other modern developments which electricity had made available. Concluding, the Lord Mayor handed to the Prince an album containing particulars of the installation. The chairman of the Electricity Supply Committee (Coun. A. J. Ward) explained that the electricity undertaking had been in the hands of the Corporation since 1888; there had been constant progress, and to-day the undertaking was one of the largest in the country. They had expended on the system nearly three and a half millions of money; the annual income exceeded one million pounds; the h.p. of the plant was 124,000; the charges for electric power were among the lowest in the country, and this year they appropriated £25,000 out of the profits towards the relief of the rates.

Councillor Ward also referred briefly to the assistance the undertaking had given to the Government during the war.

The Duke of York, in declaring the station open, congratulated the Electricity Supply Committee, the chief engineer, Mr. Fedden, and all those associated with him, in their great achievement. If, he said, in order to meet competition in the markets of the world, manufacturers were forced to economise, it was in his view a better policy to seek a solution of the problem in scientific research, than merely to fall back upon a curtailment of wages. In the future the prosperity of the manual worker depended so largely upon scientific development in their industries, that he would appeal to the younger generation to let that truth sink well into their minds.

THE ELECTRICAL MARKETS OF SOUTH AMERICA.

ARGENTINA BUILDING LARGE POWER STATION. BRAZIL DEVELOPING ITS WATERFALLS.
CHILEAN AND PERUVIAN OPENINGS.

By PERCY F. MARTIN, F.R.G.S.

IT is the considered opinion of those who have had the opportunity of studying the States of South America on the spot, that their great industrial future reposes largely in the use made of their potential water-power. Up till now, only the larger and wealthier countries—such as Brazil and Chile—have entered upon the development of their resources in this direction, and then in but a modest manner in no way in consonance with their importance or promise. Clearly, then, in view of the vast strides made by hydro-electrical engineering, there exists a wide and practically unoccupied field for undertakings, the development of which will help to solve some, at least, of the pressing national problems affecting economics in these Latin-American States—such as railway transport and the raising of oil.

Few of these countries are endowed with cheap fuel; some, like Argentina, are without even the necessary water-power to replace it. On the other hand, Brazil, Chile, Columbia, Ecuador, Peru, and Uruguay have been greatly gifted in this respect, their many waterfalls and fast-flowing rivers awaiting but the skill of the engineer and the funds of the financier to bring them into commercial value. Argentina must rely upon central supply stations of large capacity, as, having an installation of many thousands of kilowatts, it is possible to offer rates that are lower than the cost of energy produced upon a small scale in isolated plants. Everything in the way of machinery and plant entering into the production of electricity must be purchased from abroad; hence, one of the most promising of the South American markets is to be found in the premier State, notwithstanding that competition there is of the most acute character. The demand for motors and all kinds of wiring devices has never been more pronounced than to-day, while accessories of all descriptions are upon the invoice-lists of every dealer in the Republic. The only local production of any importance is in connection with electrical devices such as electroliers and fixtures, which can only be brought into the country subject to heavy and almost prohibitive duties.

Unlike Argentina, its near neighbour, Brazil, possessed of entirely different physical characteristics, as a market for hydro-electric equipment has not its superior in the New World. The mountainous nature of over two-thirds of the inhabited part of Brazil, especially in the south, the ever-increasing knowledge that is being gained of the commercial possibilities attending the harnessing of the many waterfalls met with, and the readiness with which both the Federal and State administrations grant facilities—and even financial subsidies—for the exploitation of these power sources, make Brazil a highly attractive field for the manufacturer of electrical plant. The rivers, both large and small, are mostly distinguished by cataracts, very numerous in some cases, many of which are destined to prove important factors in the industrial development of the country. Practically every small town, and certainly every city, has, or shortly will possess, its own electric light installation. There is a steady but ever-growing market for water-wheels and turbines, electrical motors, cables, &c., while throughout the Republic there is an unsatisfied demand for small machinery such as that used in sawmills, &c., which can be run by water-power, and for small installations of baking, laundry, box-making, and similar miscellaneous machinery.

When the writer was last in Brazil he learned that the greater part of the electrical imports were being derived from the United States, not that these manufactures had been successful above those of other countries in securing the favour of buyers, but because the makers' agents were the more energetic in soliciting orders, and, in the absence of competition, capturing them. Another feature of the American success may be attributed to the fact that the power companies in Rio de Janeiro, Sao Paulo, Santos, and Bahia are controlled by Canadians with pre-conceived ideas of the superior fitness of American machinery for these purposes. The strongest lines in imports of electrical goods are transformers, insulated wire, generators, and motors; in these specialities our trans-Atlantic rivals beat us. But in cables, the United Kingdom stands almost unassailable. Germans, on the other hand, have a strong hold on the Brazilian market for arc-lamp carbons and incandescent lamps. It is believed, however, that incandescent lamps (metallic filament) such as are made by firms like Edison-Swan, the English Electric, the General Electric Co., and the Metropolitan-Vickers Co. would prove good selling articles in this South American State. There should also be a market for British-made miscellaneous small material, such as wiring devices, &c.

Chile has greatly neglected the opportunities presented by her remarkably fine, if not very numerous, waterfalls, several of which are capable of providing immense power for industrial purposes. In a country which cannot supply anything approaching enough coal for its needs, mechanical power can alone redeem its industries. A more complete study of Chilean waterways and potential water-power is now proceeding under the immediate supervision of the Minister of Public Works, and the next ten years are destined to witness a very great transformation in the equipment of factories and railways with plant and machinery for electric operation. Already a commencement is being made in the direction of electrification of the State railways (starting with the important Valparaiso-Santiago line), and this, it is understood, is likely to be followed by similar enterprise in other parts of the State at no distant date.

Large supplies of electrical equipment will be necessary in connection with the fitting up of the new Valparaiso Docks, rapidly approaching completion; with the port improvements, not as yet finished, at Lebu and Constitucion; with the important port of San Antonio, where the new breakwater is all but completed; in relation to the waterworks at the Curico improvement scheme (under the direction of the Inspeccion General de Hidraulica); in connection with the extension of the drainage works at Valparaiso; and many other public, as well as several private undertakings. Although to-day a not very alluring market is presented for British manufacturers on account of the vagaries of the exchange—a complaint applicable to practically every other country in the world, with the exception of Switzerland and Japan—the time is not far distant when Chile will offer great possibilities for the manufacturers of electrical machinery and plant for factory use; for up-to-date appliances for household use; industrial control material; insulators, lamps, line material, medical apparatus, and small motors.

Peru, the adjoining State, is even better provided by nature with potential water-power, but up till now little use has been made of the opportunities available. It may, therefore, be assumed that here, again, is a wide-open field for manufacturers, once normal financial and trade conditions are restored. The most promising openings lie, perhaps, in the direction of mechanical traction; a fair number of towns have already introduced the trolley system, the principal enterprise being the Empresas Electricas Associadas, which has pro-

nounced inclinations in favour of British electrical apparatus and plant, although, so far, only the boilers have been acquired in the United Kingdom.

Big cities like Lima, Arequipa, Cuzco, Huayancayo, Oroya, Casapalca, and Junin have each their own hydro-electric plant of various capacities, while in addition to these power stations there are numerous smaller ones ranging in size from 5 to 100 kilowatts. The great field lies in providing other towns with the same facilities, since in the first-named, being fully equipped, there is now little demand for anything except lamps, wire, and wiring devices. There is, however, a favourable opportunity for the formation of a strong foreign syndicate to develop generating stations and transmission lines in certain sections of the country.

Yet another scope lies in connection with the many estates whereon are grown sugar and other crops. Many of these plantations belong to individual owners, who might well be approached with the view to introducing electrical equipments. It was understood, when the writer was recently in Peru, that tenders were to be invited for the electrification of one of the largest of the sugar mills belonging to a British company. House lighting and shop illumination offer also improving opportunities for introducing manufactures that can compete in price with the similar manufactures imported from the United States and Germany. Naturally, the more costly of the appliances are alone in demand in the cities. Shop lighting is carried out mostly by drop-lights, usually without either shades or reflectors. Since Lima has pretensions to become a fine and even luxurious city, there should be little doubt that sooner or later there will come about a change in the present methods employed for window lighting. This is generally an installation of several sockets with unshaded lamps placed upon each side of the window. Some of the establishments, anxious to follow the lead of the larger shops in Santiago-de-Chile, Buenos Aires, and Rio de Janeiro, are now gradually reconstructing their shop windows with a view to a more elaborate system of lighting instead of the method described, sometimes employing ordinary tin shades to keep the light out of the eyes of the gazer upon the goods. So far, there has been hardly any attempt to educate the Peruvians upon the subject of electric signs; it is even doubtful whether they would prove amenable, as, first, sky-signs, where introduced, have not met with the approval of the municipal authorities; and, secondly, the heavy cost of importing the signs would—certainly in the present condition of things—prove prohibitive. But on the other hand, much might be done with the introduction of large high-power lamps for placing outside shops or amusement resorts.

SERVANTS AND HOUSEHOLD MACHINERY.

By MARY GWYNNE HOWELL.

The education of the housewife in the use of labour-saving appliances is not the only task before the seller of such appliances. Too often success with the mistress is marred by the absolute refusal on the part of the maid to make use of the appliances provided to ease her work, and this is a difficulty which has to be overcome before popularity is assured.

The converted housewife, therefore, however certain she may be personally that household labour-saving equipment means better work, has still two queries to be answered:—

1. Is it really economically advantageous to provide such equipment for household servants?

2. How are they to be trained to use it successfully?

Since maids are neither plentiful nor cheap it is obviously to the advantage of the mistress to get the work done as far as possible by one or two maids instead of employing more. This being so it naturally makes a vast difference whether the laborious work is done by motor power or "elbow grease." In such circumstances the wise housekeeper will reduce the work by means of suitable tools into such a compass of time and effort that she will get full return for the high wages she has to pay her workers.

This point can be urged with advantage whenever a customer raises the question.

But on the second query rests the gist of the matter.

How is it possible to overcome the prejudice and ignorance of the general servant and persuade her that it is to her benefit as well as her mistress's to adopt the use of household machinery?

It is chiefly a matter of tact and patience combined with a study of psychology. There are few servants too stupid to learn under tactful instruction and guidance. Of course, some learn much more quickly than others, and apply their teaching with better results, but each and all can learn if dealt with properly.

There are two problems of human psychology involved in this matter; that of the instructor and that of the instructed. In the first place, the instructor must eradicate from his or her mind any thought that the pupil lacks the necessary intelligence to grasp the instruction. He (or she) must be willing to analyse the operations of the machine and to reduce them to their simplest terms. Having thus made the subject perfectly simple and clear to himself in every detail, the chances are that he (or she) will be able to impart it to someone else.

If the appliance seller has to leave the instruction to the mistress this fact should be emphasised.

If the instructor should be a rather fearful housewife she must eliminate the thought that any slip made by the newly-initiated worker will result in injury to the machine. This is a very natural fear on the part of the owner of the equipment, but it is hardly justified by experience. Luckily these appliances are sturdily built, and are made as nearly "fool proof" as possible. A novice may delay her work or discommode herself by turning a switch the wrong way, but she seldom does any actual damage to the machine.

The antagonism of the servant to "new-fangled" tools is largely a matter of fear of the unknown and untried. However "superior" these servants may appear to be, beneath the talk of old-ways-being-good-enough-for-me is a real nervousness of appliances of which they have had no experience.

The tactful teacher will, therefore, go to work slowly and patiently.

The machine should be operated for her one step at a time, making everything as simple as possible and using no technical terms. After a little while the servant should be persuaded to help a little with the machine until she has gained confidence. Once she has reached the stage of being pleased with herself, when manipulating the appliance, the teacher can then tactfully point out how advantageous such appliances are in general use, and thus gain the whole-hearted co-operation of her worker.

After a maid has mastered the operation of all the labour-saving appliances her mistress has provided, she should be left to carry on alone, but it is advisable for the mistress to examine the equipment from time to time, and thus make sure that the after-care is not neglected.

If such points as emptying the dust bag after each use of the vacuum cleaner; rinsing and drying the washing machine at the end of washing day; and turning off the gas in the gas heater of the ironing machine when the ironing is finished, are not recognised as important by the servant using the appliances, it is incumbent on the mistress to stress these details and to see that her instructions are duly carried out.

Whilst all this training must, in most cases, fall to the lot of the housewife rather than the appliance supplier, yet the latter by coaching his customer in the art of teaching her servants can help on the cause of labour-saving appliances, and thus overcome the present all too common antagonism on the part of domestic workers resulting in the "scrapping" of household machinery and the triumph of the "good old ways."

ELECTRICITY IN ISOLATED BUILDINGS.

By E. H. FREEMAN.

(*Concluded from page* 560.)

So far consideration has been given to plants for a lighting load only. The advantages of the electrical installation, however, include many other possibilities as has already been mentioned. Pumping and firewood sawing are often desirable; small cooking and heating appliances can be utilised and the power supply adopted for many other purposes, such as chaff cutting, root pulping, &c. It would also be possible to charge the battery of a small electric vehicle, and with a house located several miles from a railway station, to which regular visits were made, such a vehicle might be of great convenience.

Every such addition emphasises the advantages of the ordinary non-automatic plant over the automatic. The increased demand involves a greater disparity between the maximum load of which the plant must be capable and the average load required, with consequent greater difficulties of governing, &c. The non-automatic plant, with a battery of substantial capacity to help the engine in case of need, can deal comfortably with a temporary load much in excess of the engine capacity, whereas the corresponding automatic plant could not manage it at all. A belt drive for a pump or a saw bench is often difficult with a high-speed vertical engine, and the efficiency losses, if motor drives are adopted, are considerable with small units. The conditions, on the other hand, are all favourable for the horizontal engine. The plant can often be located near the well, and a convenient belt drive, direct from the engine, provided (fig. 8). Often sawing can be done immediately adjacent, and the saw also driven direct off the engine, with or without a countershaft, as shown in fig. 3, p. 558, and in fig. 9 herewith. The engine can in such circumstances be run under ideal conditions, viz., always at about its full load. If large enough to do more than the pumping or sawing, the surplus power can be used for battery

Fig. 7.—A Rustic Engine Room.

charging, whilst when used for charging only the engine is naturally running on about its full output.

With regard to the more definitely electrical uses for the installation, it is usually advisable with a small plant of 5 h.p. or under, to avoid entirely all use of electric radiators or similar apparatus that may be kept on load for considerable periods. The load on the plant from such apparatus is enormous in comparison with the lighting. A 1,000-watt radiator may be left in use for many hours on end—possibly by an oversight—and no small plant will stand up to such a demand. Kettles, vacuum cleaners, irons, and similar appliances can, on the other hand, be used fairly freely with ordinary care. No such appliance is likely to be used for more than 30 to 40 minutes at a time, and the load does not exceed a few hundred watts. The battery will easily stand this, and, if of capacity to run the normal lighting load for two or three days, will stand even excessive use of such appliances for a day or more without recharging. If examined daily, as it should be, to ascertain its condition, such a demand will do no damage as the battery can be recharged before any damage is done.

In considering what size of plant should be adopted it is best to deal first with the lighting load. The number of lamps and size of these must be settled by inspection of the building or its plans. With a non-automatic plant the battery should be provided of capacity to run

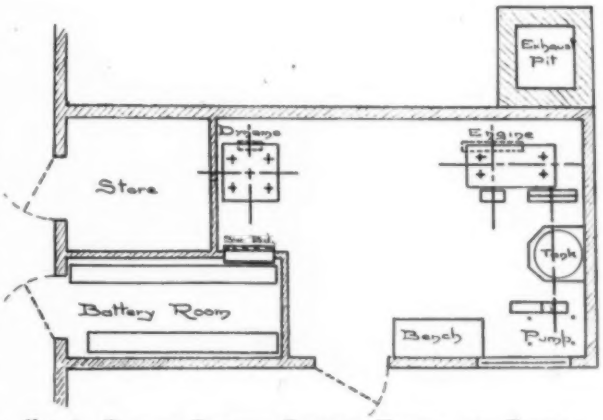


Fig. 8.—Plan of Existing Building Utilised for Electric and Pumping Plant.

the normal maximum lighting load for a full week-end, as trouble with an attendant, who only runs the plant at intervals each week, may arise if he is asked to charge up on Saturday afternoon or Sunday. It will usually be found that a battery of size to run 40 per cent. to 50 per cent. of the connected load for ten hours will be amply large. The dynamo and engine should be of size suitable for charging the battery in about six hours. If first cost is of importance a purchaser will, however, often be willing to face the extra trouble of more frequent and longer charging and to use a smaller battery, dynamo, and engine, and this is more often the case to-day, with the present high cost, than in pre-war times. The disadvantages are not really serious, as the worst trouble only occurs during a month or so of mid-winter, and the battery of a smaller plant will often provide all the lighting required for a week or ten days in summer when the Daylight Saving Act is in operation.

Once the plant for lighting purposes has been worked out, additions can be made to suit other electrical appliances. It is impossible to lay down any hard-and-fast rules on this. A gentle cross-examination of the purchaser may elicit valuable information, or alternatively a plant may be put forward as suitable for a defined and limited use of such appliances. In many cases no increase is necessary, as, in winter, when the lighting load is at its worst, irons and kettles can be heated on the kitchen range. In summer when the range is only lit in absolute necessity, the electrical heating apparatus can be used instead of the unnecessary lighting.

If pumping, sawing, and other similar operations are to be carried out, each such process must be considered on its merits. Apart from occasional special cases, such as an extra deep well, it is surprising how frequently the lighting plant fits into the needs of a house for such outside demands. Water supplies vary with the size of the house, as does the lighting load; sawing can

be done with almost any engine with care, and other power requirements also work in with a little adjustment.

An engine of 4 to 5 h.p. will do almost all the work that an ordinary farm or country house of, say, eight or ten bedrooms will need. In a recent case such an engine has been cross-cutting wood up to 15 in. diameter for firewood, and this is a heavier load than is usually necessary.

If circumstances permit, it is usually best to locate the plant near the pump, wood yard, or stables, and drive the machinery through belting and countershaft

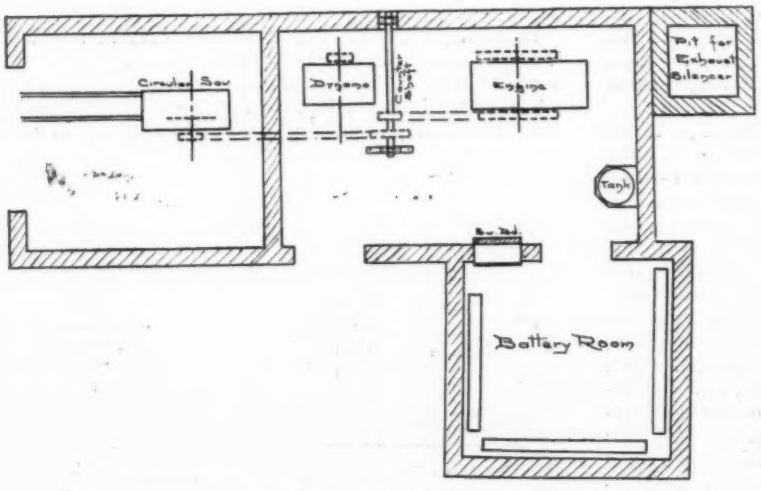


FIG. 9.—PLAN OF ELECTRICAL INSTALLATION AND SAW-MILL.

direct off the engine. One man can then attend to the whole operation, and there is no irregular load on the battery. If the machinery is motor driven, and is located some distance from the engine, the attendant must give some attention to the engine, with consequent loss of time in travelling between engine room and machines if running off the dynamo. He is also apt to run off the battery when only working for short periods, and this puts an undue and irregular strain on a small battery.

The location of the plant raises the question of the best voltage to adopt. It is rarely advisable to put in a plant for less than 50 volts. It may cheapen the cost of the plant to adopt 25 or 30 volts, but there will be an appreciable increase in the mains and internal wiring, particularly if any heating apparatus is to be used. Also such apparatus is difficult to obtain for less than 50 volts—and particularly difficult for 30 volts, the pressure for which many American plants are designed. Greater efficiency can be attained with the lower voltage lamps, but this is only transient as gasfilled lamps of low candle power for the higher voltages will surely be on the market before long. In many cases the 100-volt scheme will be found to pay, and even at a slightly higher cost it will be preferable in the long run. The best voltage can only be settled in each case on its own merits. The plant is more expensive with the higher voltage, but mains and wiring will cost less. A balance must be struck in each case, and the decision taken on total cost in each case with, if anything, a preference for the higher voltage. A comparatively expensive high-voltage installation may be cheapest in the end by enabling existing buildings remote from the house to be used for the engine and battery. The extent to which existing buildings can be utilised is illustrated by some of the engine-room plans reproduced. These all show plants actually installed, and have been selected as being rather different from standard with this object in view. None of them is ideal perhaps, but each resulted in a substantial saving of building expenses to the purchaser.

In designing the engine room, whether existing buildings are used or not, it is advisable to find room for an oil storage tank of about 100 to 120 gallons capacity. This will hold a couple of barrels of oil in excess of a safe reserve. A pump, piping, and cocks on some such scheme as is shown in fig. 10 will be found very convenient. It enables the storage tank to be filled from a tank wagon or a barrel, and the running tank to be filled from either, or from the storage tank. Its use avoids the wastage that always occurs when oil is stored in barrels, and also the mess and waste of filling the tanks by hand.

Reference should also be made to the silencing arrangements. Unless the engine room is a considerable distance from the house this is of great importance. Fig. 11 shows an arrangement which is almost always effective with the exhaust pipe from the engine running to a silencer in a pit from which an escape pipe runs up 10 or 12 ft. above ground. The pit should be covered with an iron plate loaded with non-friable stone and adjusted so that it will just lift enough with a back fire in the pit to allow the expanding gases to escape without damage to the structure. If the cover is rigidly fixed such damage may be serious.

The mains between engine room and house are, of course, very important. They should be of section to suit the normal maximum load with a voltage drop of 1 to 1½ volts on a 50-volt scheme, or 2 to 3 volts on a 100-volt scheme. The internal wiring should be designed to give a drop well below the I.E.E. allowance, so that the total drop to the worst point in the house will be about 5 per cent. on the normal maximum load. If on special occasions a much heavier load should occur, arrangements must be made for varying the number of cells in circuit to suit the load. It is, of course, possible for this to be done automatically, but the apparatus is expensive and complicated.

The mains can be run overhead or underground according to local conditions. The former is, of course, much cheaper. If run overhead it is as well to avoid running through trees; natural growth of boughs makes regular attention necessary to avoid leakages and breakages. If run underground, in all except a few districts where special conditions of soil exist, a plain lead-covered and armoured cable laid direct in the ground is quite satisfactory, and is as cheap as anything. It is always advisable to avoid running rubber-insulated cables underground. Even for runs to single lamps for entrance gates and road lighting it will nearly always pay in the long run to put in paper-insulated lead-covered and armoured cables if conditions are not favourable to overhead conductors.

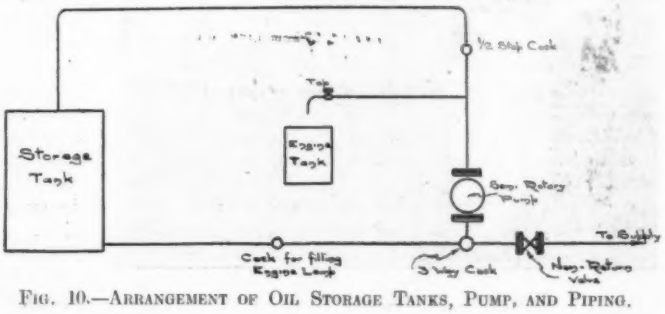


FIG. 10.—ARRANGEMENT OF OIL STORAGE TANKS, PUMP, AND PIPING.

The final question for consideration is the system of wiring to be adopted in the house itself. As regards

this point also it is impossible to give any definite answer. No system is always the best, but in the writer's opinion a lead-covered twin system is more often right

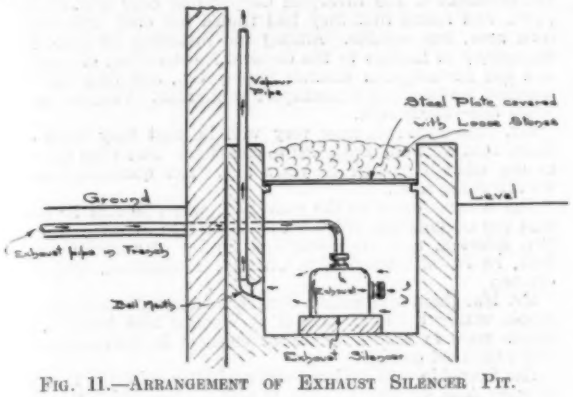


Fig. 11.—Arrangement of Exhaust Silencer Pit.

than any other. Tubing would perhaps have decided advantages in a new building, but it increases the cost substantially, and its use involves much more damage and consequent redecoration in an old building.

It is very doubtful if earthed return systems are worth while. The saving in first cost is very small, and there is the disadvantage that some day a public supply may be available almost anywhere. Most companies would not connect up an earth return installation on a d.c. supply, and would only connect up on a.c. through a double-wound transformer, and the consumer would then be saddled with a permanent transformer loss for all time.

It is of course impossible to lay down any rules for the lighting fittings for the individual rooms. The personal taste of the purchaser must play an important part in settling this point. Bowl fittings for indirect or semi-indirect lighting are advisable when conditions suit, as larger and more efficient lamps can then be used instead of a greater number of small lamps. Bracket lighting is seldom advisable unless the character of the room calls for this form of lighting. The lamps are badly placed, coming at about eye level, and must be screened with silk or other shades with consequent loss of light—which implies an increase in current for efficient lighting. For the same reason cornice and other concealed lighting is seldom advisable on a small private plant installation in which efficiency of the lighting system is necessarily important. It is, however, best to decide this question specially for every room in every house. Some actual examples are given in figs. 12, 13, and 14, herewith.

Fig. 12.—Lighting Direct by Pendant and Portable Lamps.

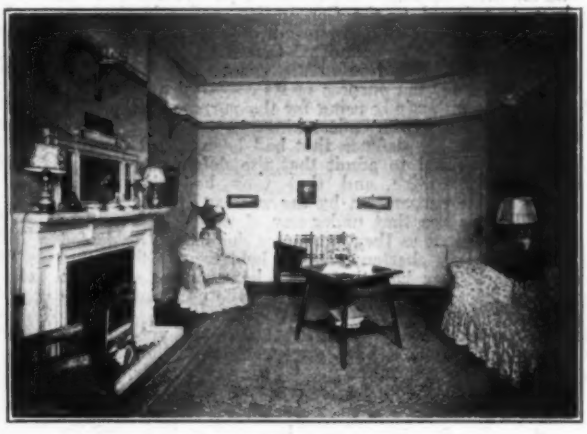


Fig. 13.—Lighting Indirectly from Cornice Fittings and Directly by Portable Lamps.

With Stannos wiring the writer's experience has not been satisfactory. It may be ideal on a work bench, but is not sufficiently "fool-proof" on the actual job. Careless wiring or accidental strains behind skirtings and under floors involve risks of trouble that cannot be discovered and that may not be developed for years. Cab tire sheathed cable has advantages, but its cost does not differ greatly from twin lead, and it is certainly not so neat in appearance for surface work. The sheathing also is very liable to deterioration (rapid in unfavourable conditions) where in any state of stress—for example, where bent at too sharp an angle or where pinched too tight in a cleat.

Lead-covered wiring can be badly installed like every other system, but it is probably more fool-proof than any other, and it has the merit that any fault shows up strongly. A nail driven through one conductor of a C.T.S. cable into a wood joist might nevertheless be a source of future danger. A similar happening on a twin lead job would show a dead earth.

Fig. 14.—Semi-indirect and Ornamental Lighting.

LEGAL.

The Attorney-General v. Liverpool Corporation.

An action by the Attorney-General at the relation of a number of ratepayers of Liverpool against the Liverpool Corporation, was commenced before Mr. Justice Russell in the Chancery Division on Thursday, November 3rd. The ratepayers were A. Angers, D. Cormack, F. Collins, F. B. Hellor, E. C. Marr, S. A. McLeish, Pulford Bros., Ltd., A. E. Stanwell, R. A. Harrison-Watson, and F. Wilde, all of whom, it was stated, carried on business as suppliers of electrical fittings, &c.

What they desired were two declarations that the Corporation had no power to carry on the same kind of business as themselves either within or without the city, and that it had no power to use for this business the funds, plant, property, premises, or staff of its electrical undertaking. They also asked for an injunction restraining the Corporation from carrying on the business.

The Attorney-General was represented by Mr. Alfred Page, K.C., Mr. Cartwright Sharp, and Mr. H. G. Purchase; and the defendants by Mr. F. H. Maugham, K.C., Mr. Courthope Wilson, K.C., and Mr. Harold Mather.

Mr. Page said the defendants were the local authority for the purposes of the Electric Lighting Act, and they now claimed that they were entitled, by virtue of that Act and various provisional orders granted to companies that they had bought out, to carry on the business in question throughout the whole of the city of Liverpool and its extensions; and the city was now ten or twelve times as large as it was in 1835, when its boundaries began to be enlarged. He referred to the provisional orders granted to the Liverpool, Toxteth Park, and Garston Electric Lighting Companies, the powers under which had been transferred to the Corporation, and said that the latter purported to act in pursuance of those powers in carrying on the business. He submitted that the Corporation had no such power, that it had unlawfully spent and was spending capital borrowed for the purpose of its electrical undertaking, and that it was unlawfully using for the purpose of the business the plant, &c., of the undertaking.

With regard to the defence that had been raised, counsel said he was prepared to admit that the defendants were a common law corporation, and that they had the powers granted to such a corporation by the various Royal Charters. But he did not agree that under any of those charters they had the power to act as they were now doing, and he denied altogether that any charter could be held to give them that power. Even if they had that right, however, he said that they were still limited in the use of it by the provisions of the Municipal Corporations Act of 1882.

Mr. Maugham: Your second proposition is not denied. With regard to the first, I do not suggest that the charters expressly give us power to trade. What we say is that under the charters we became a common law corporation, and therefore have all the rights of a person at common law. The conclusion I shall ask his Lordship to accept is that once we are accepted as a common law corporation, we have got every power, subject to the Municipal Corporations Act.

His Lordship: There does not seem to be much between you on that point.

Mr. Page: I say that from the time of King John down to the present, Liverpool have in fact never claimed any such power, and have never carried on any trade in their own name, and that all the charters intended to do was to create them a municipality with powers to regulate their own concerns, and the only persons mentioned in the charters as entitled to trade are, not the Corporation, but the various inhabitants of the city. Even if Mr. Maugham is right, I am instructed that I should be able to show that the Corporation do in fact use their funds for the purpose of this trade in a way which is not specified by the Municipal Corporations Act, and that therefore it is illegal.

One of the points of the defence, he said, was that inasmuch as Parliament had allowed the Corporation to buy, not only the whole electrical undertaking of the Liverpool company, but all their property and assets and all their rights, powers, and privileges, among those rights was that of carrying on this extensive business.

Mr. Maugham said they were admittedly carrying on the business, and they claimed the right to do so.

Mr. Page then referred to the provisional order of the Garston Electric Lighting Co., which gave them the power, not only to manufacture and supply energy, but also to sell electrical apparatus, &c. The Corporation had stepped into the shoes of the Garston Co., but he submitted that when that company sold out, although they rid themselves of the power to sell electrical fittings, &c., they did not hand them over to anybody else. He contended that before the Corporation were entitled to use that power they were bound to get specific authority from Parliament. Neither in the case of Garston nor in that of any of the other districts had they obtained that authority.

He then called Mr. Robert Tweedy Smith, of 89, Chancery Lane. He said he was the solicitor for the relators, and also solicitor to the Electrical Contractors' Association, chairman of the Sun Electrical Co., Ltd., and of Rawlings Bros., Ltd., a member of the Electric Light and Tramways Committee of the Southend Corporation, and a Fellow of the Royal Society of Arts. He had had considerable experience in the carrying on of electrical undertakings, and special experience in dealing with the accounts of local authorities. He had examined the accounts of the Liverpool Corporation over a number of years, and found that they had traded not only within their own area, but outside. Among the instances he gave were the supply of fittings to the General Electric Co., of London, and the Birmingham Electric Supply Co., and they had also supplied materials to a Southport gentleman. That was some years ago—about 1896.

Mr. Maugham: It may very well be that they were contracts that we were compelled to complete. But I am not here to say what happened 40 years ago. The question is what we are doing now?

The witness came to the year 1910, when he said he found that the Corporation did work at Oswestry; in 1916, at Woolton, Allerton, and Wallasey; and, in the estimates book for 1917, he found references to Chester, Normanton, and Manchester.

Mr. Maugham said quite a number of the references were to people within the area, such as at Woolton and Allerton, and others were to people who were engaged in business in the area and lived outside.

His Lordship said if there was no better evidence than this of work done outside the area, it was a waste of his time.

Mr. Page: I won't say any more about trading outside the area except this, that if the defendants are right in their contentions, they are not doing anything wrong.

The witness then went through the accounts of the electrical undertaking, and in cross-examination said that the fittings department made very few bad debts, and that was one of the complaints of the contractors in Liverpool.

Mr. Maugham: You mean the members of your Association?—Yes, and the relators. The Corporation is in a most exceptional position in this matter.

When the case was resumed on Monday, Mr. Maugham, K.C., continued his cross-examination of Mr. Tweedy Smith upon his evidence concerning the work done by the Corporation's fittings department for other departments and the methods of charging. The practice adopted, said counsel, had been to charge the department wanting the work done plus certain percentages.

The Witness said that varied in different years.

Counsel: Has your investigation of the accounts shown you that the profits charged to the departments were less than those charged to outsiders?—No; more. There were a few exceptions.

I put it to you that with a few exceptions the practice throughout has been to supply goods to Corporation departments at a lower profit than is ordinarily charged to outsiders. Is your answer "No"?—Yes.

Are you confident of this?—I am confident of the figures that I will give you. I can only speak of what I find in the books. I took specific years and it is on those years that I am speaking, viz., 1916 and 1920.

Well, then, take 1916. Are you pledging yourself that the books of the Corporation for 1916 show that the Corporation charged a higher profit to the departments than to outsiders? Can you say "Yes" or "No" to the question?—I haven't the figures.

You mean you cannot answer the question.

He asked the same question with regard to 1920, and the reply was that the percentage charged to outsiders was 35 to 45 per cent. and to the Corporation departments between 20 and 10 per cent.

Is there a single year for which you can pledge yourself that the profits charged to outsiders were less than those charged to departments?—No, I cannot without the books. I would rather go by the books.

His lordship is not going to allow you to take an account in court.

The sales book for 1915-16 was handed to the witness, but objection was taken to the quotation of single items.

Witness: If I cannot quote single items it would mean an analysis of the whole year.

Counsel: I have a gentleman here who has made an analysis and he can tell the court what the facts are.

Mr. Henry James Cash, managing director of H. J. Cash and Co., Ltd., electrical engineers, of Caxton House, Westminster, said he had had 23 years' experience in the trade, and particular experience of supplying wires in buildings for electricity. He gave his interpretation of the meaning of establishment charges and what they included. He said they included rent, rates, taxes, insurance, stock, employers' liability, salaries, commissions, &c., and he estimated that these would account for some 15 per cent. of the turnover.

Mr. Leonard George Tate, secretary of the Electrical Contractors' Association, said a fair percentage to add for establishment charges would be from 15 to 18 per cent. on contracts of about £20,000, down to 10 per cent. on big contracts of anything up to £100,000.

Mr. R. Harrison-Watson, partner in the firm of John Hunter & Co., electrical contractors, of 11, Paradise Street, Liverpool, said he was a member of the local branch of the Electrical Contractors' Association, and hon. assistant secretary, and one of those who initiated the present proceedings. There were about 40 members of the Association in Liverpool, being the principal electrical contractors on building work.

Mr. Page: Can you speak of two recent cases where the Corporation have carried out complete electric instalnations for private customers?—Yes.

Are you a ratepayer?—Yes.

Do you object to the ratepayers' money being utilised for this purpose?—Yes. I think it is unfair to us, when the Corporation have unlimited capital behind them.

His Lordship: I assume all that. He would not be here if he didn't.

Mr. Courthope Wilson, K.C. (cross-examining): How many electrical contractors are there altogether in Liverpool?—About 60.

I suggest that there are at least 100?—I cannot say.

Do you suggest that the Corporation are in any way unfair in their treatment of the contractors?—No except by trading against us.

Is it not a fact that when they want work done in schools or fire stations they give the contractors the opportunity of tendering?—The surveyor's department has always done that.

Tendering, that is, as against the fittings department?—I don't know whether they ask the fittings department.

Counsel asked the witness if he knew that since 1909 the electrical work placed by the surveyor represented 39 installations, and that of these the fittings department took 12 and the contractors 27.

His Lordship: The witness cannot possibly say that.

Counsel: Are you prepared to dispute that the contractors do a good deal more work on the Corporation public buildings than the fittings department?—I don't know that, but I should not have thought so.

I suggest that it is to the advantage of the electrical industry in Liverpool as a whole that the Corporation carry on this fittings department?—We don't agree with that.

His Lordship: Neither hardship to them, nor the benefit you say you confer on the public, moves me in the slightest. What I have got to try here is a legal question.

This ended the evidence for the relators, and Mr. Cartwright Sharp gave a short summing-up. He submitted that the Corporation were carrying on the business with money which they had no right to use for the purpose. It was clear, he said, that the borough fund, the rates, and the takings of the electricity department could not be used.

For the Corporation, Mr. Arthur Collins, the treasurer to the City of Birmingham, was called. He said he had examined the accounts of the undertaking since 1911, and in each year from then, with the exception of 1913, the fittings department had shown a profit.

From your investigation of the accounts, asked Mr. Courthope Wilson, are you able to say whether the carrying on of the fittings department has involved a charge on the borough rate?—There has been no loss. On the contrary, the general funds of the Corporation, so far as they have been affected by this trading, have been benefited.

What loading for profit to outside people and the Corporation departments are shown in the accounts?—The results I found were: In 1916, on Corporation business, the loading was 15¼ per cent., which amply covered the whole cost, and on private business 35 per cent. The prices charged were precisely the same as private contractors made.

In your opinion has there been any improper inflation of this business?—No.

James Witter, the Corporation superintendent of electrical installations, said he was with the Liverpool Electricity Supply Co. when the Corporation took over their business. That company used to sell all sorts of electrical fittings. When the Corporation took it over they confined installation work to the City of Liverpool. They continued the company's showroom for five years and then gave it up. They had now no showroom, and the Corporation did not now carry on any line of business that the company did not carry on.

Percival James Robinson, deputy city electrical engineer, said he was with the Garston Electricity Supply Co. before it was absorbed by the Corporation. That company carried on a fittings business which was confined to its area. So far as he knew the Corporation did not engage in any work outside the city.

This completed the evidence for the Corporation, and Mr. Page began his address on the law. The defendants, he said, claimed that they had statutory authority to carry on the business and were therefore not affected by the provisions of the Municipal Corporations Act.

His Lordship said he thought the defendants claimed that they got their authority from the Liverpool Transfer Act, 1896.

Mr. Page said the question was whether that Act had conveyed to the Corporation any power whatever from the company to carry on any business except that of the statutory undertaking, and he submitted that the Act contained no provision entitling them to use the rights of the company as if they were a trading company. He suggested that all that vested in the Corporation was what was described in section 4 as "all the powers, duties, and obligations in relation to the supply of energy."

The hearing was resumed on Tuesday, when Mr. Page concluded his speech, and Mr. Maugham, on behalf of the Corporation, submitted that the relators had failed on the allegation that the Corporation had spent part of the city fund on the business. His lordship intimated that in view of the importance of the case to the parties he would put his judgment into writing.

An Unemployment Dole Case.

A Southport electrician who drew an unemployment dole whilst doing spare time work was fined £10 by the Southport magistrates last week. During May and June the defendant, a youth of seventeen years, applied for and received a grant of 29s. per week, at the same time working as an electrician at the Southport Pier Pavilion during the evening performances. For the defendant, it was stated that he was entitled to receive unemployment pay if he was doing spare time work which he had been accustomed to do before receiving the out-of-work pay, providing his wages did not exceed the amount of the dole.

British Thomson-Houston Co., Ltd. v. Corona Lamp Works, Ltd.

The hearing of this appeal from the decision of the Court of Appeal, confirming the decision of Mr. Justice Sargant that the plaintiffs' patent was invalid, came on in the House of Lords on Monday. The appeal is being heard by Lords Haldane, Finlay, Cave, Dunedin, and Shaw. Sir Arthur Colefax, K.C., opened the case for the appellants, who ask the House of Lords to say that the judgments of the courts below are erroneous and should be reversed. The original action, it will be remembered, sought an injunction to restrain the Corona Co. from infringing the B.T.H. half-watt lamp patent.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Lighting Bakers' Ovens.

With reference to "Electro's" letter in your issue of October 8th, and Messrs. R. W. J. Stark's and "C. A. B.'s" communications in your issue of the 21st inst., *re* lighting bakers' ovens, Messrs. Moncrieff Bros., Leven, were in the same position as "Electro" a few years ago, having experienced similar trouble. This was one of the problems laid before the writer when he returned from Government service, and a drawing was got out and protected for an air-cooled light for this purpose which is not so complicated as that proposed by "C. A. B." The cooling air enters at a bottom passage, passes round the lamp, and exhausts at a top passage; the difference between the temperature of the outgoing air and that of the incoming air is 100 deg. F. Two models are manufactured; one is for an induced flow of cold air past the lamp due to the heated air rising and passing out of the top opening; in the other model, known as model "B," the top passage is connected to the flue of the oven, thus drawing a strong current of cold air past the lamp.

We enclose herewith for forwarding to "Electro" a photograph of the original experimental model, showing the centre part, which slips inside a metal case fitted in the oven wall. This original model has since been improved to take gasfilled lamps.

The original model was made for Mr. D. K. Robertson, baker, Leven, and has been in successful operation with one lamp for the past two years without one complaint, using ordinary metallic lamps. A switch is fitted to the outside case, and the centre portion can be withdrawn for cleaning the glass front or replacing the lamp without disconnecting any electrical connection, the wires passing to the lamp being encased in flexible steel tubing. The glass front is specially manufactured for this purpose, and there has not been an instance of its fracturing. This lamp is fitted in a steam-heated oven, but where ordinary fired ovens are used, this firm supplies as an addition a metal cover for the glass, which is lowered when blowing through the oven, although the latter is really not required.

J. B. Moncrieff.

Leven.
October 27th, 1921.

The Principles of Wages Determination.

I was interested to read what Dr. Gisbert Kapp said in your issue of the 28th ult. about the margin left for division between Capital and Labour. The experience of the past few years has led me to the same conclusion, namely, that there is no margin for readjustment.

What is wrong with Capital and Labour (taking Capital to mean the captains, and Labour the rank and file of industry) is that both are victims of burdensome taxation on the one hand, and restricted opportunity on the other. The latter is due to our refusal to open up natural resources by taking the public revenue from the public value of land. Secure tenure is necessary for industry, but it should be conditional upon the payment of ground rent to the rightful owners of the realm for common services, instead of allowing the fund to go into private pockets. There is no security while industry is regarded as fair game for plunder, and there will be inevitably niggardly production so long as the reward of industry is not

there to be equitably divided, whether by the Whitley method or any other. No conciliatory spirit is possible between those who have to apportion miserable profits.

John E. Grant.

London.
November 3rd, 1921.

In your leading article which appeared on October 21st, you refer to my advocacy of a living wage based on the size of the average family, and, while you agree with this in principle, you foresee difficulties in practice. But, Sir, the noble savage practises this very principle, and the fact that, thanks to false economic ideas, our Government consists of men who do not know how to govern, is surely an argument against a Government fulfilling its first duty, viz., the provision for all of their full necessaries of life. According to R. L. Stevenson, "Politics is perhaps the only profession for which no preparation is thought necessary," and when a Government is composed of engineers, doctors, men of science, and organisers (not, be it noted, a "business" Government of bankers, merchants, and shopkeepers), right principles may, after all, be put into practice.

Mr. Hichens advocates payment by results, but if you refer to my book you will find that this is also insisted upon. But what is the first *result* of man's efforts? Why, the production of the aforesaid necessaries. Thus payment according to the size of the average family *is* payment by results, and does not permit a man to slack or live upon his fellows, as at present.

Further, whence comes this objection to payment by results, but from acceptance of the law of supply and demand? Goods are the product of labour. If the price of goods falls as their supply increases, so must wages. Consequently the labourer is fully justified in his foolish ideas, so long as price fluctuations are permitted.

There is, however, no virtue in reducing prices under normal conditions, and what is wanted is a *stable* currency. This can only be obtained by *fixing* the prices of all necessaries of life permanently, and by paying higher wages only *pari passu* with the increased production. Thus only can the workers earn and receive higher wages without raising prices, and thus only can a constant and real living wage, *i.e.*, one which will *always* purchase these necessaries, be established.

J. S. Hecht.

Lausanne.
November 5th, 1921.

Telephony—or Telepathy?

I wonder if you or any of your readers can explain the following occurrence:—A lady staying at a country house, wishing to use the telephone, took off the receiver and distinctly heard a conversation between her host and his agent; thinking that they were using other 'phones on the same line, she put back the receiver and waited till later for her call. Afterwards it transpired that her host and his agent had not been on the 'phone at all, but had held their conversation out in the park, somewhere near the telephone wires.

I should like to know the explanation of this; it beats me altogether.

T. W. Best.

Norwich.
November 5th, 1921.

[Perhaps there was a trunk line in the park, or the host's remarks may have electrified the agent. We know that Major-General Squier uses trees for wireless telephony; perhaps he could throw light on the occurrence.—Eds. Elec. Rev.]

The Durability of Lead-Covered Wiring.

In my experience the system of wiring in lead-covered cables is unsatisfactory as, apart from the action of certain acids, the writer found the following troubles on different installations:—

1. Twice pierced by nails at switch drops.
2. Complete breakage at some point under plaster (cause unknown).
3. Twice nibbled by rats or mice.

In cases 1 and 2 the wiring had to be cut away at the point of entry into plaster, joints to be made, and the leads re-run on the surface in steel conduit. In case 3, new wiring had to be let in under the floors.

Again, if lead-covered cables have to be run in steel chases, tubes down walls, &c., what is the advantage? The conduit system undoubtedly, in the eyes of an engineer, is *the job*, and if only the electrician carrying out the work will make a mechanical job of it, there is nothing better—either C.J. or screwed, as the installation calls for.

With inspection fittings, the whole of the conduit well fixed (not thrown together) throughout with saddles and cramps, the wiring being afterwards drawn in, the ultimate result is unquestionable, both for accessibility and long life.

The finished job becomes a mechanical one, which is so essential, and a good man will cover as much ground on this as on any other system.

But there is always the half-bred mechanic to upset these excellent systems. I have found only recently a beautifully made wood reducing piece, reducing ¾ in. to ½ in. tube, joints in conduit, no conduit down partitions or through walls, conduit on surface badly kinked and fixed with nails bent over, and a few days ago I discovered in a modern installation several conduits led into a rough wooden box without a lid, and nailed to the joist under the floor.

This box was packed with wires jointed to outgoing leads, and feeding the numerous points, and possibly to other wooden boxes!

What system this is I have so far failed to comprehend, but it was certainly a contractor's nightmare.

R. H. Andrew.

Excessive Heating of Armature.

I shall be glad if you can give me any information regarding a fault on a machine which recently came under my notice. The machine in question is a 400-kW d.c. generator, running direct coupled to a steam set at approximately 550 r.p.m., the voltage being 480-520. After a short run an excessive heat is set up right round the armature core tips and outer windings. The heat is quite general, and is not greater at any one point, the inner windings and the bottom of the slots being comparatively cool. A fan, fitted on the main shaft, has been suggested, but this, while possibly reducing the heat, would, of course, have no effect on the fault itself, and would consequently be rather an unsatisfactory way of surmounting the difficulty. The air gap is quite uniform, and the field (the machine is shunt wound) appears to be all right. It may possibly be that some of your numerous readers have experienced similar trouble, in which case I shall be indebted to them for any information on the matter.

A. R. M.

Glasgow.
November 1st, 1921.

Rapid House Wiring.

With reference to the letter in your issue of the 21st instant from Mr. H. H. Pearson, may I say that I can substantiate this gentleman's remarks, as I am at present carrying out several schemes on the system he mentions (the J. & P.), and am obtaining results even better than those Mr. Pearson claims. So far from Messrs. Jessop & Boydell's claim being extravagant, I agree with Mr. Pearson that it hardly does justice to the full possibilities of the metal-sheathed surface fixing system in its most up-to-date and perfected form.

In my case, the pendants are made ready before going on the site, and a good deal of time is saved by this means.

Cyril F. Barrow.

Bury.
October 31st, 1921.

Electricity in Isolated Buildings.

The article under Mr. Freeman's signature in your issue of October 29th has apparently been written with insufficient knowledge of the trend of present-day products and lack of consideration for the initial and running costs of isolated plants.

There are so many points at variance with the practical comparison of the old and new methods that in justice to the industries concerned in this country, exception should be taken at the outset.

There is no doubt at all that, had it not been for the semi-automatic lighting sets with their isolated installations working with practically no attention all over the country, a great many more men would not have secured employment, and the fact that these sets are still being bought is proof that they are still being wanted.

However much conservatives may hold to old methods, progress will not be gainsaid.

Truth to tell, comfort with economy is what is selling the modern semi-automatic lighting set, and it is doing this in a field, and at a price, untouched by the older and obsolete method.

R. F. Long,
M.C., A.M.I.E.E., A.F.Aer.I.

Stockport.
November 3rd, 1921.

Argentina.—*The Review of the River Plate* gives the following particulars of a new joint stock company authorised to operate by a recent decree of the National Government:—

"Compania Platense de Electricidad, Siemens Schuckert. Authorised August 5th, 1921. Domicile: City of Buenos Aires with right to establish branches. Duration: 20 years, with right to prolong. Object: to do business industrially and commercially in all classes of electrical goods, machinery and installations, &c., &c. Capital $3,000,000 m/n in 3,000 shares of $1.000 m/n each, divided into five series, each of 600 shares. Board: President Emilio Albert; Vice-President, Carlos Ley; Director, Richard Diercks; Director-alternate, Pablo Klappenback; Syndic, Silvestre H. Blousson; Syndic-alternate, Otto E. Frederking."

BUSINESS NOTES.

Bankruptcy Proceedings.—W. E. C. Jarvis (Darlaston and District Electrical Engineering Co.), electrical engineer, 18, King Street, Darlaston.—Receiving order made November 2nd on debtor's own petition. First meeting, November 16th, at the Official Receiver's Office, Wolverhampton. Public examination, December 7th, at the Court House, Walsall.

F. C. Nichols, 19, South Street, Scarborough (Scarborough Motor & Accessories Supply Co.)—The following are creditors herein:—

	£		£
Moore & Son	100	Scattergood & Johnson ...	11
Scarborough Electric Supply Co.	75	Partridge & Co.	00
Woodall & Wood	105		

Company Liquidations.—Hudsons Electrical Engineering Co., Ltd.—At the meeting of creditors a Committee of Inspection was appointed to investigate the position of affairs and decide upon the best method of realisation. This committee, consisting of Ald. J. Stringer Hinchcliffe (Hinchcliffe, Green Manufacturing Co., Ltd.); Mr. F. Thornber (George Ellison), and Mr. J. H. Currick (Greenwood & Batley, Ltd.), decided to offer the whole of the stock in trade, plant, fixtures, fittings, &c. The sale by auction was announced to take place on 8th and 9th inst. at Leeds, by Messrs. Whittam & Sons.

Guildford Electricity Supply Co., Ltd.—Meeting of creditors to-day, November 11th, at Guildford. Particulars of claims must be sent to the liquidator, Mr. B. D. Holroyd, by December 1st.

Renew Lamp Co. (Eastern), Ltd.—Meeting December 5th, at 3-4, Great Winchester Street, E.C., to hear an account of the winding up from the liquidator, Mr. H. D. Carey.

Heads (Electrical), Ltd.—Meeting of creditors is called for November 17th, at 151-2, North Street, Brighton. Liquidator: Mr. A. E. Orbell.

For "*Phonophone*" Construction Co., Ltd. (Elec. Rev., November 4th; p. 600), read "*Phonopore*."

Electric Fishing Co., Ltd.—Meeting of members called for December 10th, at Barclay Bank Chambers, Newborough, Scarborough, to hear an account of the winding up from the liquidator, Mr. F. C. Gardiner.

Trade Announcements.—An electrical engineering department has been opened by Mr. F. C. Bath, of the Gordon Road Works, Camberley, Surrey.

The Manchester Electrical Co., of Bull's Head Yard, Corporation Street, Manchester, wishes to receive catalogues and price lists of lamps, cables, domestic appliances, &c.

Mr. L. G. Coade has relinquished his appointment as works engineer to Messrs. Simplex Conduits, Ltd., Birmingham, to enter into partnership with Mr. Robert Sell, A.M.I.E.E., proprietor of The Industrial Engineering Co., 190, Ashted Row, Birmingham, who have been appointed technical representatives for the Park Royal Engineering Works, Ltd., Messrs. Royles, Ltd., and the Titan Lift Co., Ltd., in the Midland district.

Messrs. Belling & Co. have opened showrooms on the ground floor at 18, Berners Street, Oxford Street, London, W. 1, where a full range of their electric heating and cooking appliances is on exhibition. The firm are issuing, as a sales stimulating measure, a very large five-colour poster illustrating a girl switching on one of their electric fires.

With reference to our notice regarding the dissolution of partnership of the Electric Block Co., of Halifax, Mr. F. E. Crowther informs us that he is attending to debts and will continue the business.

Mr. H. N. Shorrock, late manager for Mr. Geo. Morrison, 6, Victoria Street, Morecambe, has bought this branch of the business, and will carry it on under his own name. He asks for catalogues of electrical goods.

Catalogues and Lists.—Messrs. J. W. Brooke & Co., Ltd., Adrian Works, Lowestoft.—An illustrated and priced description of the "Brooklite" 1-kW power set.

Sterling Telephone & Electric Co., Ltd., 210-212, Tottenham Court Road, W. 1.—Leaflet No. 307, giving revised list prices of standard apparatus.

The Consolidated Pneumatic Tool Co., Ltd., Egyptian House, 170, Piccadilly, W. 1.—Three illustrated leaflets dealing respectively with an oil rivet-heating forge, the "Boyer" hammer pick, and electric stone and chipping hammers.

Messrs. Dewhurst & Partner, Ltd., 28, Hatton Garden, E.C. 1.—An illustrated publication giving particulars, dimensions, and prices of one-, two-, and three-phase motors.

Messrs. Daniel Adamson & Co., Ltd., Dukinfield, Manchester.—An illustrated guide to the firm's manufactures, which include boilers, steam turbines, condensing plant, turbo-blower sets, &c.

The British Aluminium Co., Ltd., 109, Queen Victoria Street, E.C. 4.—A postcard detailing the many uses of aluminium for household purposes.

Watt Motors, Ltd., Premier House, 150, Southampton Row, W.C. 1.—An illustrated description of "Watt" motors.

The Visco Engineering Co., Ltd., 21, Bedford Row, W.C.1.—An illustrated pamphlet describing the "Visco" air filter.

The British Electric Transformer Co., Ltd., 50, Oxford Street, W. 1.—A coloured card advertising "Tricity" "flame" fires.

Mr. George Ellison, Perry Bar, Birmingham.—An illustrated booklet giving a very full description of electric crane control equipment.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C. 2.—Leaflets X2,651 and X2,656 giving respectively revised catalogue prices and addenda to the company's list of low- and medium-pressure switchgear.

Electrical Components, Ltd., 90, Great Charles Street, Snow Hill, Birmingham.—Abridged price list of electrical accessories (No. 92), including cut-outs, bowl fittings, switches, lamp-holders, &c.

Messrs. James McMillan & Co., Clun House, Surrey Street, Strand, W.C. 2.—An illustrated price list of telephone apparatus for local and central battery service instruments, switches, &c.

Messrs. Lang & Squire, Ltd., Wales Farm Road, Acton, W. 3.—An illustrated price list of d.c. dynamos and motors, double wound d.c. to d.c. converters, and tapped d.c. to a.c. rotaries. Full dimensions are given.

The B.E. Co. (of London & Birmingham), Ltd., Hendon House, 57, Upper Thames Street, E.C. 4.—A priced and illustrated leaflet advertising the "Beco" cigarette, cigar, and pipe lighter.

Messrs. Bruntons, Musselburgh, Scotland.—Illustrated booklet fully describing the construction, method of operating, and typical results obtained by the use of Haigh's alternating stress testing machine.

Copper and Lead Prices.—Messrs. F. Smith & Co. and Messrs. James & Shakespeare report, November 9th, no change in last week's quotations.

Book Notices.—*Punch Almanack* for 1922 (one shilling) comes to hand reminding us of the nearness of Christmas. It contains many a laugh, and is well worth its cost.

"Foreign Exchanges and How to Profit by Them," by V. L. Gerard. London: Pall Mall Industrial Investments, Ltd. Price 1s. M. Gerard is a French banker and, naturally, his views favour France. He considers that the franc is greatly undervalued, and that French Government Loans are a better investment than British Consols. He states that the mark is purposely depreciated, and thinks that the internal purchasing power of this unit of currency is greater than the foreign exchange quotations indicate. He admits that the low level of the mark looks a tempting gamble, but the recent series of falls somewhat alters the position. The Italian lira is looked upon favourably. He criticises severely the financial methods of the United States, and accuses British banks of withholding, at America's command, the people's credit from national industries, to the detriment of British trade. In his last chapter the author advocates a return to the "gold standard," however imperfect it may be.

"Hardening and Tempering Engineers' Tools," by G. Gentry, pp. 61, illustrated, price 9d. net. London: P. Marshall and Co. This small book is full of practical information about the heat treatment of steel in ordinary workshop practice, dealing with the apparatus employed, the methods of hardening and tempering steel (in detail), with many hints for special cases, forging tools, and case-hardening. The novice is apt to think that the hardening and tempering of steel are very simple matters because they look simple, but this book will show him that there is a great deal more in them than is evident to the casual observer. In its higher developments, the heat treatment of steel is a science in itself, but for the small workshop this handbook contains all that is necessary for the user to know. A coloured frontispiece showing the tints of the "colour scale" is a useful feature.

"The French Polishers' Handbook." Pp. 114. Illustrated. London: P. Marshall & Co. Price 2s. net.—This book, the fruit of practical experience, gives numerous receipts for staining wood, grain fillers, French polishes, &c., and detailed explanations of the accessories and processes employed, with excellent illustrations. It will be most useful to the amateur worker, and even the professional may derive valuable hints from it.

Journal of the Institution of Electrical Engineers and Index to Vol. 59. Vol. LIX, No. 303. July, 1921.—This issue contains the following papers: "Present Conditions and the Hopkinson Principles," by Mr. J. R. Blaikie; "Multi-part Tariffs for Domestic Electricity Supply," by Mr. J. W. Beauchamp; "Abnormal Pressure-rise in Transformers," by Mr. R. Torikai; "Development of Army Wireless During the War," by Lt.-Col. A. G. T. Cusins, R.E.; and "Electric Oscillations in Straight Wires and Solenoids," by Prof. J. S. Townsend, F.R.S.

"Modern Gasworks Practice," by A. Meade. Second edition. Pp. xii+815, figs. 474. London: Benn Bros., Ltd. Price 55s.

"Modern Electrical Theory"—Supplemental Chapters—Chapter XV, "Series Spectra," by N. R. Campbell. Pp. 5 + 110. London: Cambridge University Press. Price 10s. 6d. net.

"O-Kai, a Fantasy of Now and Then," by E. C. Reed. London: C. W. Daniel. 3s. 6d. net.

Social Events.—The entertainment section of Tucker's Athletic and Recreation Club (J. H. Tucker & Co., Ltd.) held their opening social evening of the season on Saturday, October 29th, in the works canteen. The proceedings opened with a musical programme, with Mr. W. Y. Smith (superintendent of assembly) in the chair, followed by a whist drive. Mr. S. Greene (hon. secretary) acted as M.C.

Last Saturday evening at Eustace Miles's Restaurant, Charing Cross, there was held the first of a series of whist drives by the staff and friends of Messrs. J. & W. B. Smith, Ltd., of Farringdon Road, E.C. Mr. Frederick Watkinson is president, and the organiser is Mr. A. Matton, the firm's advertising manager, who organised the charabanc outings held during the summer. The company at the whist drive on Saturday numbered just on one hundred. After the "drive," eleven presents were distributed to the winners. Following the "drive" came a programme consisting of songs, monologues, and recitations, interspersed with dancing.

Unemployment.—The "live" registers of the labour exchanges for the week ended October 28th showed that there was a further increase in the number of unemployed, from 1,423,792 in the previous week to 1,606,900. There was a slight fall in the number on short time. The Ministry of Labour attributes the large increase to the re-appearance of those whose right to benefit had lapsed, these having re-registered to qualify for the new period of relief which commenced on November 3rd.

Algeria.—The general electrification of the French Colony of Algeria is now under consideration by the Governor-General. A Commission authorised to examine the conditions under which the transport and distribution of electricity is to be effected, both for the service of the railways and supply to manufacturers, has made its report, on the strength of which a new commission of three technical specialists has been appointed, whose decision is now awaited.

The Nottingham Electrical Wholesalers' Association.—The second annual dinner of this Association was held on Friday last at the Black Boy Hotel, Nottingham. Invitations were extended to the local contractors, and a large combined gathering was the result. The toast of "The King" was given by Mr. Crammond, and that of "The Visitors" by Mr. H. M. W. Royce, Mr. A. Markwick responding. Musical and other items were provided by Messrs. F. G. Skerritt, H. M. W. Royce, E. Bryan, and J. H. Poxon. The "hit" of the evening was the reading of an original and humorous "Ancient Document" by Mr. Royce. The function was a success, and augurs well for the maintenance of the good fellowship already existing between the wholesalers and the contractors of the city.

For Sale.—Birmingham Corporation Electricity Supply Department has for disposal one 750-kW generating set, consisting of a Yates & Thom compound engine direct coupled to a G.E.C. d.c. generator, complete with surface condenser, air pump, and circulating water pump.

Edinburgh Corporation Electricity Department invites offers for one 600-kW Howden-G.E.C. triple expansion non-condensing set and one 600-kW Belliss-Bruce Peebles triple expansion non-condensing set.

(See our advertisement pages to-day.)

Trade Conditions and Unemployment in the Electrical Industry.—In reporting the proceedings of the deputation that met Sir Alfred Mond last week, we were unable to spare space for the following list of bodies represented on the Joint Conference of the electrical industry, which shows how comprehensive and representative it was:—

Joint Industrial Council for the Electrical Cable-making Industry, comprising: The Cable Makers' Association and Independent Cable Makers' Association, and the following Trade Unions: National Amalgamated Union of Labour; the Workers' Union; the Amalgamated Society of India-Rubber Cable and Asbestos Workers; the National Union of General Workers; and the Electrical Trades Union.

Joint Industrial Council for the Electricity Supply Industry, comprising: the Incorporated Municipal Electrical Association; the Incorporated Association of Electric Power Companies; the Conference of Chief Officials of the London Electric Supply Companies; the Provincial Electric Supply Committee of the U.K.; and the following Trade Unions: The Amalgamated Society of Gas, Municipal, and General Workers; the Dock, Wharf, Riverside, and General Workers' Union; the Electrical Trades Union; the National Amalgamated Union of Enginemen, Firemen, Mechanics, Motormen, and Electrical Workers; the National Amalgamated Union of Labour; the National Union of General Workers; and the Workers' Union.

Joint Industrial Council for the Electrical Contracting Industry, comprising: The National Federated Electrical Association and the Electrical Trades Union.

The British Electrical and Allied Manufacturers' Association Incorporated, comprising 210 manufacturing companies and firms.

The Electrical Wholesalers' Federation, comprising 73 wholesale distributors of electrical apparatus and appliances.

The British Electrical Development Association, comprising 379 electricity supply undertakings and 950 manufacturers and contractors.

Birmingham Fittings Trade.—Our local correspondent reports that the Birmingham electrical fittings manufacturing industries are suffering from the prevailing depression rather more than recently. He says: "The relapse which has caused a good deal of unemployment is attributed largely to the severity of German competition, which has been possible only by reason of her depreciated currency. From an export point of view, too, the situation is by no means satisfactory. Many of the foreign markets are overstocked with electrical fittings, and both the Indian and the Australasian demand is considerably below the post-war normal."

A Demonstration Kitchen.—The Metropolitan-Vickers Electrical Co., Ltd., has recently opened a new showroom and demonstration kitchen in Bristol. The kitchen, which is shown in the accompanying illustration, is equipped with a number of modern electrical appliances, which are demonstrated for inquirers by trained assistants. Cooking, washing, ironing, and clothes-drying are done.

In the showroom is an exhibition of all kinds of lighting fittings, fires, small cookers, and other appliances. Here assistants show the efficiency of vacuum cleaners for carpet sweeping, &c. The room is very tastefully furnished and decorated. The building has two show-windows, in which are displayed lighting fittings, fans, and other apparatus.

METROPOLITAN-VICKERS DEMONSTRATION KITCHEN.

Local Electrical Exhibition.—From October 31st to November 5th, Messrs. Baxendale & Co. held a special exhibition and demonstration of electrical appliances in their showrooms, Grass Market, Edinburgh. The usual articles were shown—kettles, grills, irons, percolators, &c., and visitors were shown the working of an electric washing machine. A special line of "Miller" lighting fittings was exhibited, including table standards, bowls, &c.

An Industrial Lighting Campaign.—We have received from Benjamin Electric, Ltd., full details of its efforts to induce manufacturers and others to install efficient lighting, or to aid factors to secure this.

A mass of literature advising as to the best means of gaining the attention of those who may prove good customers has been published in bound form. This commences with an introductory note and some extracts from the report of the Home Office Committee on Lighting in Factories and Workshops, detailing the effects of bad lighting upon efficiency and production. A selection of letters follows, and a number of illustrated pamphlets are also included. A special point is made of convincing works' managers of the inefficiency of their lighting by means of a simple but effective "Lightmeter."

The Training of Ex-Service Men.—The Minister of Labour, speaking at the Preston instructional factory for the training of disabled ex-Service men, said that the number of the men still remaining unabsorbed by industry was still very great. There were 28,500 firms upon the King's Roll, and these were employing 345,000 disabled men; but still much remained to be done. Mr. Macnamara said that when men left the instructional factories they were really first-class craftsmen. The reason why there were men waiting to enter the factories was that the Local Technical Advisory Committees feared that particular industries might be overcrowded, but the speaker thought that their view should be broadened somewhat.

Lead.—In their report dated November 5th, Messrs. James Forster & Co. says that with trade as it is and a resumption of shipment here, both from Spain and Australia, they can see no sustained improvement in the price of lead, which is higher relatively to other metals.

British Samples, Ltd.—The Federation of British Industries has sent us particulars of a scheme for maintaining exhibitions of British samples in the leading foreign commercial centres. To this end a company has been formed with the title "British Samples, Ltd.," and the Federation sees so much promise in the scheme that it has consented to act as the British agents of the company. A booklet accompanying the Federation's letter describes the first of these sample "rooms," which is at 9, Rue de Ligne, Brussels. The suite comprises a main hall, measuring 50 ft. by 40 ft.; an inner hall, 25 ft. by 40 ft.; and an upper floor in which is a range of rooms available for private displays. The height limit of the showcases is 7 ft., and ample advertising space is therefore available on the walls of the halls. A number of varied services are rendered by the company and the F.B.I., 39, St. James's Street, S.W.1, will be glad to supply full details to those interested.

Ukraine Electrical Provision.—According to the *Ekonomitcheskaya Zhisn*, the electrical industry in the Ukraine has made poor progress. The big V.E.K. factory of the Ukraine was transferred from Riga in 1915. The pre-war electrical factory of Kieff has a modest output of 5,000-6,000 poods of copper cable. There is a number of small repair shops and small armature concerns that arose during the revolution, also the radio-telegraph plant in Odessa. At present there are seven more or less important town stations in the Ukraine of from 1,000 to 10,000 kW capacity, some small stations in the local towns and villages, and a number of peasant industrial electric stations distributed over the Donetz and Krivoi Rog basins, of a total capacity of 50,000 kW. Practically everywhere the electrical stations are in a half-ruined condition, and their rehabilitation proceeds slowly for want of repair material and because of labour trouble. But the state of the V.E.K. is on the whole satisfactory; its difficulties arise chiefly over lack of materials of second rate importance. Most of the qualified workmen came from Latvia, and, being dissatisfied with the conditions, they have mostly returned home.

Tube Extension Scheme.—The Government has decided to appoint a Committee of Inquiry consisting principally of financial experts, to investigate and report upon the schemes of extensions proposed by the Underground Railways Co. of London, Ltd. The object is to decide whether this work will be eligible for guarantees under the Trades Facilities Bill.

The Times, however, is informed that the scheme does not come under the Trade Facilities Bill. Lord Ashfield's proposal is to raise the £6,000,000 capital required in the City in the usual way. What he asks from the Government is a short Bill giving effect to the safeguards which he has propoesd.

The Premier, in reply to a question in the House of Commons, on November 7th, stated that Lord Ashfield had been informed that the Government could not promote legislation to protect the companies against competition, but at the same time the Government wished the important work to proceed. It is probable that a revised scheme will be drawn up.

Electrical Appliances in Canada.—The popularity of electricity in Canada for lighting homes and operating household appliances is shown by the fact that 74.9 per cent. of the residences, so situated that electricity is available for use, are wired. Electric flatirons are used in 45.7 per cent. of these; electric toasters in 18.2 per cent.; electrically-operated washing machines in 5.9 per cent.; electric fans in 5.4 per cent.; electrically-operated vacuum cleaners in 5 per cent.; electric ranges in 3.1 per cent.; electrically-operated sewing machines in 1.2 per cent.; electric dishwashers in 0.7 per cent.; and electric refrigerators in 0.6 per cent.—*Electrical Review* (Chicago).

Public Works, &c., Congress.—The Congress which is being held in connection with the Public Works, Roads, and Transport Exhibition, commences on November 19th. A conference on "The Purification of the Atmosphere" has been arranged for the first day. The last day, November 25th, is being organised by the I.M.E.A., and, up to the present, two papers have been announced: "Electric Vehicles for Municipal Purposes," by Mr. F. Ayton, M.I.E.E., and "The Application of Electricity to Municipal Services," by Mr. S. J. Watson, M.I.E.E. The chair will be occupied alternately by Bailie W. B. Smith, O.B.E., a member of the Glasgow Electricity Committee, and Mr. S. T. Allen, M.I.E.E., president of the I.M.E.A.

Applications for British Trade Marks.—Appended is a summary of the recent applications for British trade marks in respect of goods and productions associated with the electrical trades and industries:—

Elgon. No. 417,068. Class 18. Electric alarms as systems in buildings.—Richard Dittmayer, 8, Striesenerstrasse, Blasewitz, Dresden, Germany. July 19th, 1921.

Meriditt. No. 417,069. Class 18. Electric alarms as systems in buildings.—Richard Dittmayer, 8, Striesenerstrasse, Blasewitz, Dresden, Germany. July 19th, 1921.

Minirisk. No. 416,258. Class 18. Electric alarms as systems in buildings.—The Minirisk Co., Ltd., 47, Victoria Street, London, S.W.1. June 18th, 1921.

British Made (lettering and design). No. 405,480. Class 8. Electric cables made in Great Britain.—Ward & Goldstone, Ltd., Sampson Works, Salford, Manchester. June 24th, 1921.

Vec. No. 416,199. Class 13. Electric lamps (ordinary) made in Holland.—Victoria Electrical (Manchester), Ltd., 27, Berry Street, Buxton Street, Manchester. June 16th, 1921.

Red Dragon. No. 416,969. Class 13. Electric pushes, oil fillers, &c.—W. F. M. Rose, trading as Meekan Rose & Co., Blackhorse Garage, West Street, Bristol. July 14th, 1921.

Surbide (lettering and design). No. 417,697. Class 8. Electric accumulators (not for medical purposes).—Chloride Electric Storage Co., Ltd., Clifton Junction, Manchester. August 16th, 1921.

C. & O. (lettering and design). No. 409,333. Class 13. Electric lamps (ordinary) and fittings for electric lamps.—Crowther & Osborn, Ltd., 7, Blackfriars Street, Salford, Manchester. November 2nd, 1920.

An A.E.G. Absorption.—The A.E.G., of Berlin, proposes to absorb the undertaking of the Mix & Genest Telephone and Telegraph Co., of Berlin-Schoneberg, by means of an interchange of shares. Curiously enough, the offer is not being made to the shareholders in the latter directly, but by a banking group in the name of the Berlin Electricity Works Co., whose supply works were expropriated by the Berlin municipal council.

Bradford Health and Home Exhibition.—Amongst the exhibitors at the first Bradford Health and Home Exhibition, opened at Belle Vue Barracks on November 4th for a fortnight, are the Corporation Electricity Department; Rycroft and Co., Ltd., Aldermanbury, electric fitters; Henry Wilson (Bradford & Birmingham), Ltd., electrical contractors, of Forster Square; the Unit Electrical Co., Hall Ings; and Electrical Services, Ltd., Aldermanbury.

Electricity Salesmanship Conferences.—A series of conferences has been initiated by the British Electrical Development Association, Inc., having for their object the bringing together of persons interested in the sale of electricity or electrical material and appliances, and the promotion of discussions on short papers or lectures dealing with the various aspects of load building and salesmanship. Admission to the conferences will be by tickets, to be obtained from the E.D.A. Offices (Hampden House, 84, Kingsway, London, W.C.2). All persons engaged in the industry and coming into contact with the public in the course of their work are eligible to attend and take part. The subjects dealt with will be commercial rather than technical. It is not intended that the conferences should in any way replace the work of existing organisations for discussing the technique of the business, but that they should concentrate upon methods of popularising the use of electricity, and presenting the advantages of electrification to the consuming public. The proceedings will not be open to members of the general public. It is proposed to deal with salesmanship in relation to some different aspect of the domestic load at each meeting, getting different persons in the industry to take the chair and different experts in each branch of electrical merchandising to read short papers and open discussions. Six meetings will be held in London this session, but we have no doubt that provincial electrical men will see the need for similar gatherings elsewhere.

The first conference is to be held on Friday, November 18th, at 8 o'clock, at the Institute of Chartered Patent Agents, Staple Inn Buildings, W.C.1. Mr. S. T. Allen, M.I.E.E., will preside, and Mr. E. H. Freeman, M.I.E.E., will speak on "Salesmanship in Wiring and Installation Work." Brief records or minutes of proceedings will be made with a view to circulation for the assistance of provincial centres doing similar work in affiliation with the E.D.A.

Austin Motor Co.—It is reported that debentures for £200,000 (10 per cent.) in this company have been taken up by Sir John Leigh, Bart., and that the company's affairs are to be taken out of the hands of the receiver. A Manchester newspaper reports that the company has booked a large contract for cars (£517,500) from a Manchester company, also other important contracts.

New French Company.—La Co-operative d'Electricité de la Region de Peronne is the name of a new undertaking which has lately been formed to establish an electricity generating plant to supply electricity for lighting and power purposes to 35 communes in the Peronne war devastated area. The capital of the concern is 3,000,000 fr., of which the French Ministry of Agriculture is advancing 2,000,000 fr., repayable in thirty years.

The Belgian Electrical Industry.—According to the *Eclairage et Force Motrice*, the improvement in electrotechnical business in Belgium seems to be increasing. As a matter of fact, the last reports of the correspondents of the Ministry of Industry and Labour show that demand continues good for electrical machines and apparatus. One firm at Mons is about to make extensive enlargements of its works. Orders are growing both in number and value. There is marked activity in installation material, and good craftsmen are being sought after. At Antwerp, notwithstanding the strengency which has prevailed generally, the local electric supply company has been compelled to undertake the building of a new transformer station near the Central Railway station to satisfy the growing demand for power from the large manufacturing firms. The new station will be of a capacity of 5,000 kW, and will be equipped with two transformer groups of 1,000 kW each. It is expected to be working by the end of the year.

New Belgian Companies.—There has been formed at Brussels (Place Louise 1) the "Electrolux," to trade in all appliances relating to electricity and especially electric vacuum cleaners. Capital, 100,000 fr.

Under the style of Constructions Electriques du Centre, there has been launched at Godarville a company, with a capital of 275,000 fr., for the building of motors and other apparatus and the installation of lines, networks, central stations, &c.

With a capital of 1,250,000 fr., there has been formed at Brussels (Rue Berthelot 152-4) the Compagnie Industrielle et Commerciale d'Electricité for trading in and the construction of electric material, for its own account or for third parties.

H. De Launoy & Cie. (489 Chaussée de Waterloo, Brussels) has been constituted a company, with a capital of 200,000 fr., for the representation of Belgian and foreign metallurgical and electric construction firms.

The Société Anonyme Chauffage Fladen et Mignot has been established at St. Gilles (17 Place Maurice Van Meenen) for the purchase, sale, and manufacture of all kinds of heating, ventilating, cooking and washing apparatus, &c. Capital, 200,000 fr.

LIGHTING AND POWER NOTES.

Australia.—Newcastle (N.S.W.).—The annual report of the Municipal Council's electricity supply undertaking for the year ended December 31st, 1920, shows a total revenue of £66,499 as compared with £36,583 in the previous year. Working expenses totalled £55,325 (£27,460), leaving a gross profit of £11,173. After payments to sinking fund and interest, &c., there was a net surplus of £8,356.

Barton-on-Humber.—Street Lighting.—The Urban District Council has declined to entertain an application from the Barton Electric Supply Co. for an increase in the contract price for street lighting.

Bedford.—Extensions.—The extensions which were put into commission on October 29th consist of a Parsons reaction turbine coupled to a 1,500-kW single-phase alternator. The steam-raising plant comprises four B. & W. land type boilers in two pairs, with the chimney between them. These are each guaranteed to produce 15,000 lb. of steam per hour at 200 lb. per sq. in., superheated 250 deg. F. Chain-grate stokers are fitted, and can be used for either forced or natural draught. The chimney is of brick-lined steel and 100 ft. in height. In order to use the new boiler plant to greater advantage, a connection has been made with the old steam range so that the Westinghouse turbine in the old works can be supplied with steam, through a reducing valve, at 130 lb. per sq. in. The exhaust steam from the auxiliary plant (a small steam turbine driving two pumping sets) is used for heating the condensate and make-up water which is returned to the boilers at about 200 deg. F. The 6,600-V switchboard consists of stone cubicles containing oil switches, isolating switches, &c. The cubicle doors are interlocked with the switches to prevent opening while the power is on. The switches are electrically operated from a top gallery. The 6,600-V gear is linked up to an older 2,000-V board through three transformers. A battery of 57 cells has been installed, and this is charged by means of a mercury vapour rectifier.

Brentwood.—Electricity Supply.—The Urban Council has appointed a committee to consider the details and figures of two electric lighting schemes submitted to it.

Canada.—The Winnipeg Electric Railway Co. has announced that satisfactory arrangements have been made for the financing of a new power development at Great Falls on the Winnipeg River, some 63 miles from the Manitoba metropolis. When completed the plant will have a capacity of 168,000 h.p., and is expected to cost about $10,000,000. Work on the construction of the plant is already under way, about 200 men being employed at the present time, though it is expected that from 1,000 to 2,500 men will be required at later stages.—*Railway Gazette.*

Cannock.—Electricity Supply.—An agreement has been arrived at between the Urban District Council and the West Cannock Colliery Co., for the supply of electricity to the district, and arrangements are being made for the erection of a transformer station and the laying of cables.

Continental.—Italy.—By a decree appearing in the *Gazetta Ufficiale* the provinces of Venezia, Treviso, Belluno, Padova, Rorigo, Vicenza and Ferrara are authorised to form an autonomous group for the utilisation of the hydraulic forces of the basins of the Brenta and the Piave, and their tributaries, as well as the other watercourses of the provinces. The bodies entitled to form part of the group include the various communes, reclamation and irrigation consortiums, chambers of commerce, savings banks, and other public bodies and companies. The group will construct plant and distribute and sell electricity; its capital is unlimited, and will consist of shares of 50,000 lire each, redeemable within fifty years. The group is also empowered to raise loans and issue bonds.—*Reuter's Trade Service* (Rome).

Belgium.—At the recent meeting of the Société d'Electricité de l'Est de la Belgique, the directors reported that in order to meet the increasing demands for electricity, the laying down of further plant had become necessary. The capacity of the company's central station at Verviers has been extended from time to time, but no further extensions there are now possible, the demand on the local water supply for the boilers having reached the maximum. The directors have, therefore, entered into an arrangement with the Société Intercommunale Belge de l'Electricité, which already operates one of the largest power stations in the country, whereby the last-named company will establish on the banks of the river Meuse a new central station with a capacity of not less than 20,000 kW, from which to supply the whole of the power required for the clients of the Société d'Electricité de l'Est de la Belgique. The Intercommunale Co. will also take over the management of the Verviers power station which, when the new Meuse station is completed, will be used as a reserve plant.

France.—A concession has been applied for to set up a distribution network for public services between Bernay, Lisieux, Glos, Cambremer and Bonnebosq in the departments of Calvados, Eure and Orne.

La Société Normande d'Electricité has recently secured a concession for the supply of electrical energy for lighting and power purposes in the Departments of l'Eure and Seine Inferieure.

The Forces Motrices de la Vallée d'Aspe has in hand two schemes for electrical developments. The first comprises the extension of the existing generating station called Forges d'Abel to 3,600 h.p.; the erection of a 6,000-h.p. station at Esquet, expected to be completed by the end of 1922; the building of a station of 3,300-h.p. capacity on the Lake of Estaens, and the construction of a high-pressure distribution network to serve, from these stations, the districts of Oleron, Pau, and Bayonne. The second scheme includes the erection of four generating stations, on as many falls, the energy supplied being distributed in the districts of Bordeaux and Auch. The total yield will be 70,000 h.p.

Application has been made by the Société de Transport d'Energie des Alpes for a concession to set up three main lines and a number of minor ones in the Alpine regions connected with various existing generating stations. The main lines are intended to carry 35,000 kW, and will be equipped for 120,000 volts and eventually 150,000 volts, if technically feasible. The total power of the generating stations is estimated at 550,000 kW.

Glasgow.—Electricity Extensions.—The Clyde Valley Electrical Power Co. has had installed at its power station at Yoker a turbo-alternator supplied and erected by the Metropolitan-Vickers Electrical Co., Ltd. The maximum output of the installation is 30,000 h.p., the set operating at 1,500 r.p.m., generating 3-phase, 25-period, a.c. at 11,000 volts. Cooling water is drawn from the river Clyde by centrifugal pumps, supplied by Messrs. Drysdale & Co.

Grampian Scheme.—Treasury Assistance Sought.—The company which has been formed to develop the water power of the Grampians is seeking Treasury aid for the scheme. The project will absorb a considerable amount of unemployed labour and encourage the introduction of new industries to Central Scotland.

Heckmondwike.—Year's Working.—The revenue account of the electricity undertaking shows a net loss of £3,668 for the year ended March 31st last.

Hove.—Price Reduction.—The Electricity Committee has decided to reduce the charges for lighting purposes by ¼d. per unit as and from the meter readings after January 1st next. No reduction is to be made in the charges for power until the price of coal becomes stable and further experience has been obtained as to the working of the bulk supply from Brighton.

India.—Punjab.—The Punjab Government intends to encourage as far as possible alternating current generation and transmission, and has decided upon the following standard frequencies and voltages: Frequency, 50 cycles (or 25 cycles for special cases). High pressures: 11,000 V, 6,000 V, 3,300 V, and 2,200 V at generator terminals; primary pressures for transformers, 2,000 V, 3,000 V, 6,000 V, and 10,000 V; secondary transformer pressures, 115 V, 230 V, 460 V, and 525 V, at no load. Standard low pressures: At generator terminals, 115 V, 230 V, 460 V, and 525 V; at consumers' terminals, 110 V, 220 V, 440 V, and 500 V, or 400 V, between phases. When a lower pressure than 110 V is desired 55 V or 75 V may be employed. The standard pressure for tramway supply is 500 V.

Jersey.—Strike.—A dispute has arisen between the Dock and General Workers' Union and employers, over a proposed reduction of 2d. per hour for "unskilled" labour. The employers have refused to agree to arbitration until the district secretary of the Union apologises for making a statement regarding the profits of the builders and allied trades. The power station engineers have stopped work in sympathy with the building workers, and the island is in darkness.

Keighley.—Year's Working.—The annual report of the electricity department shows a total revenue of £61,517, as compared with £47,782 in the previous year. Working expenses amounted to £50,164 (£41,360), leaving a gross profit of £11,353. After deduction of interest and sinking fund charges there was a net deficit of £6,954. In the previous year there was a deficit of £5,942.

Kells.—Electricity Supply.—A committee has been appointed to consider a scheme submitted by Messrs. McEntee, Lavelle & Gregory for the supply of electricity to the town. The scheme provides for a revenue of £2,400, which, after deduction of working costs, will leave a gross profit of £1,572.

Kilmallock.—Cost of Lighting.—The District Council has appointed representatives to meet the Electric Lighting Co. to consider the question of renewing the Council's grant towards the cost of lighting the area.

Lancaster.—Extensions.—The Town Council has decided to carry out plant extensions, to meet the increased demand for electricity, at a cost of £8,000.

Law.—Electricity Supply.—The County Council has applied for a Special Order for the supply of electricity to the parish. It is proposed to obtain a supply of electricity from the Wilsons & Clyde Coal Co.

Liverpool.—Electricity Supply Extensions.—With a view to providing work for unemployed electricians, the local branch of the E.T.U. has approached the town clerk with regard to expediting electrical work now in abeyance, including the erection of a new transformer station at Aintree. The town clerk has informed them that the work will be proceeded with as soon as a suitable site can be obtained for the sub-station.

Llanfairfechan.—Electricity Supply Scheme.—The proposal to spend £10,000 upon a supply undertaking for the town is meeting with strong opposition. The Council is holding a special meeting to discuss the proposals. It is stated that the question of electricity supply has been under consideration for eight years.

London.—Willesden.—The Electricity Commissioners have sanctioned the borrowing of £30,000 for mains extensions.

Replacement of Fuses.—The Highways Committee of the London County Council submitted the following recommendation at the Council's meeting on November 8th: "That the attention of the Electricity Commissioners be drawn to the practice adopted by some electricity undertakers of charging consumers for the time and attendance of their workmen in cases in which safety fuses within consumers' premises have to be renewed and to the fact that, in view of the regulations made by the Board of Trade under Section 6 of the Electric Lighting Act, 1882, the levying of such charges would appear to be unjustified; and that the Commissioners be asked to consider taking such steps as will acquaint electricity consumers with their rights in the matter."

Newcastle (Co. Down).—Electricity Supply.—The Urban Council has approved the agreement for the lighting of the town by electricity.

New Zealand.—Dunedin.—The report of the engineer (Mr. M. C. Henderson) upon the electricity undertaking, which is one of the largest in the Dominion, for the year ended March 31st last, records a total revenue of £95,925, as compared with £84,720 in the previous year. Working expenses amounted to £37,016, as against £28,958, leaving a gross profit of £58,909 (£55,762). The net result was a profit of £20,048, an increase of £1,900 on the previous year's result. The number of units sold rose from 14,202,787 to 16,338,291, and the average price per unit fell from 1.430d. to 1.409d.

Singapore.—Extension of Supply.—The municipality is extending its supply of electricity to the European residential quarter of the town. Work is now in hand, and energy is expected to be available by the spring.—*Eastern Engineering.*

Sevenoaks.—Curtailment of Order Opposed.—The Urban District Council is opposing the local Supply Co.'s application to the Electricity Commissioners for the cancellation of the portion of the Provisional Order relating to the supply of electricity to the Oxted district, on the ground that if the local Supply Co. at Oxted succeeded in obtaining the monopoly of the lighting rights of that area, the inhabitants of the supply area of the Sevenoaks Co. would be indirectly affected.

South Africa.—Municipal Electricity Supply.—In 1919 there were 40 municipal bodies in the Union operating electric light and power stations; 15 in the Cape, seven in Natal, ten in the Transvaal, and eight in the Orange Free State. The number of consumers was 63,408; the units sold 91,674,331, and the working cost per unit ranged from .77d. at Aliwal North to 9.58d. at Pietersburg. Johannesburg, Durban, and Cape Town, in the order named, accounted for more than half of the consumers; Johannesburg numbered 20,222 consumers, who took 29,539,513 units at a cost of 1.68d. per unit; Durban, with 8,462 consumers, supplied 25,377,961 units at .69d. per unit; and Cape Town numbered 9,361 consumers, who took 15,366,505 units at 1.55d. per unit.

Krugersdorp.—The municipality has resolved to give up its power station and take a supply from the Victoria Falls Power Co. on a ten years' contract, in addition to the supply from the Randfontein Mines, which it has been taking for some time past. It is expected to save between £5,000 and £7,000 per annum by this arrangement.

Johannesburg.—At a recent meeting of the Town Council the question of supply from the Victoria Falls Power Co. was raised. The chairman of the Finance Committee stated that the Council would be authorised by the Administrator to borrow £119,000 for the development of the lighting plant. The Electricity Committee suggested that terms should be obtained from the V.F.P. Co. for a supplementary supply of electricity. Both recommendations were carried.

Tullamore.—Wages Dispute.—The Electricity Supply Co.'s works were closed down for some days last week owing to a dispute regarding wages, which was ultimately settled by the men accepting £3 7s. 6d. per week of 56 hours.

Winchester.—Loans.—The Town Council has applied for loans of £1,000 for a water spraying plant for the electricity works and £1,200 for the provision of "Olipel" remote control gear and switches for street lighting purposes.

Worcester.—Electricity Works Extension.—The Electricity Committee has under consideration the acquisition of generating plant at the Southampton Rolling Mills. The scheme involves the expenditure of £56,000, and a loan is contemplated.

Worksop.—Loans.—The Urban District Council has applied to the Electricity Commissioners for sanction to the borrowing of £4,500 for carrying overhead electrical wires to "Rhodesia," a newly-erected model village near Shireoaks.

Application has also been made to the Liverpool Victoria Friendly Society for a loan of £27,000, at 6½ per cent., for electric light extension, to be repaid in periods of from 18 to 25 years.

TRAMWAY AND RAILWAY NOTES.

Australia.—Victoria.—The Victorian Railways Department is instituting a service of electric freight trains on the Melbourne suburban system, a great part of which is served by electric traction. Several long guards' vans have been fitted with a pantograph and the necessary motors and other equipment, and it is proposed that these vans, running between the passenger time-tables, shall relieve the fast electric passenger trains of the work of dealing with suburban goods traffic.—*Reuter's Trade Service* (Melbourne).

Black Country.—Control of Tramways.—A committee of the Dudley Town Council reports the receipt of letters from the Birmingham and Midland Joint Committee of Electricity, Tramways, and Motor Omnibus Undertakings with regard to the Black Country tramways being continued as one undertaking. The companies concerned are about to promote a Bill in the ensuing session of Parliament with that object, but if the local authorities concerned are considering the promotion of a Bill themselves to form a Joint Board with a view to acquiring and operating all these tramways, the Joint Committee would be willing to co-operate with the local authorities to that end. The committee appointed the Mayor and chairman to attend any conference of local authorities convened on the subject.

Burton-on-Trent.—Accident.—On November 4th, a double-deck tramcar proceeding along Station Street at a moderate pace suddenly overturned after leaving the track. Eleven people are reported to have received injuries, the driver and conductor escaping with slight shock.

Clayton-le-Moor.—Extension of Time Opposed.—The Council has placed an objection to the application of the L. & Y. Railway Co. for an extension of time in which to construct a light railway in the Clayton district. The Council states that an extension might mean the cancellation of the scheme, and prevent others attempting the enterprise.

Continental.—France.—It is stated that the municipal authorities of Paris are contemplating the introduction of railless electric traction owing to the high cost of petrol. It is thought that this would permit of a considerable reduction of fares.

Spain.—Application has been made to the Dirección General de Obras Publicas for a concession to construct an electric railway from San Fernando to Chiclana. The Vizconde de Escoriaza is the applicant, and he is willing to forgo both subvention and guarantee of interest. If no competitor appears within one month, his application will be granted.

Guatemala.—New Electric Railway.—A new electric railway is being built from San Felipe to Quezaltenango, the capital of the district of Los Altos. It will be of metre gauge, will have a length of 27 miles, and, commencing at an altitude of 2,058 ft., will terminate at 7,058 ft. above sea level. Owing to the mountainous nature of the country the maximum grade over one-third of the distance will be at least 9 per cent., the average for the remainder being from 2 per cent. to 3 per cent. The latest type of cars for passenger and goods

traffic will be employed, the former having a seating capacity for 40 persons and the latter a carrying capacity of 15 tons. Hydro-electric power will be employed, the energy being obtained from the Salamá river, of which the Santa Maria Falls, two in number and of a height of 280 ft. and 100 ft. respectively, are capable, it is estimated, of producing 10,000 h.p., and after supplying the needs of the line, the surplus power will be utilised for the lighting of towns and coffee plantations over a wide area. The total outlay is put down at $2,200,000 United States currency.—*Chamber of Commerce Journal.*

Hull.—Introduction of Postal Boxes.—The Tramway Committee intends to institute postal collection boxes on the tramcars, to facilitate postal services locally. Such cars will be indicated at night by a special light. It is expected that delivery of letters will be expedited by twenty-four hours in some cases.

India.—New Tramway.—The Dehra Dun Mussoorie Electric Tramway Co., Ltd., has been registered with the object of building a tramway between Dehra Dun and Mussoorie. The U.P. Government has granted a concession. The capital of the company is Rs. 50 lacs. The preliminary estimate is Rs. 36,62,000. The managing agents are Messrs. T. Beltie Shah (Gilani), Rajpur Road, Dehra Dun, U.P.—*Reuter's Trade Service* (Bombay).

Keighley.—Railless Cars.—The Tramway Committee has decided to give a trial to a new type of railless car for the hilly routes at present served by the department's railless 'buses, which have been running at a heavy loss.

Leeds.—Tramwaymen's Employment Scheme.—An admirable arrangement has been come to by the employés of the Tramways Department to ensure that each man has an equal chance of being employed when the staff has to be cut down for any reason. The requirements of the department for the ensuing week are ascertained, and a ballot is taken; those men who fail to secure a place have to stand aside for the week. They are not neglected, however, for those who are retained are invited to contribute to a pool which is shared among those who are "stood off." Should a man refuse to contribute, he renders himself ineligible for this relief if he is out of work. No overtime is to be worked while the scheme is in operation.

London.—Linking-up.—Lord Ashfield recently told a representative of the *Morning Post* that the London General Omnibus Co. had experimented upon the linking-up of tramway "dead ends," for which the L.C.C. was recently refused Parliamentary Powers. The result was a failure, and the company had saved the public considerable expense.

Accident.—A delay in the tramway service was caused last week through the collision of a London United car, travelling in the direction of Acton, and a steam wagon. The car was thrown off the lines, and windows were broken. The front of the wagon was smashed and caught fire. Nobody was seriously injured.

New Zealand.—Dunedin.—The manager of the city tramways (Mr. W. H. McKenzie) reports that the total receipts for the year ended March 31st last were £115,865, as compared with £106,954 in 1919-20. Working expenses amounted to £77,925,, as against £63,625, leaving a gross profit of £37,940 (£43,329). The net result was a surplus of £9,022. The car mileage rose from 1,350,318 to 1,498,937, and the number of passengers carried from 71,707,302 to 18,744,010.—*Commonwealth Engineer.*

TELEGRAPH AND TELEPHONE NOTES.

Belgium.—Railway Communication.—Hitherto the telegraph only has been used in working the railways in Belgium. At the beginning of last month (October) the telephone was installed on the Brussels-Namur line and on the Schaerbeek quadrilateral. The special material was supplied by the Bell Telephone Co., Antwerp, and the American Western Electric Co.

China.—Telephone Extensions.—The business men of northern China have started an agitation to link up all their principal cities by telephone toll lines, declared Mr. Clark H. Minor, formerly manager of the China Electric Co. of Peking, who arrived in New York a short time ago on his way to London, where he will become commercial manager of the associated and allied companies of the International Western Electric Co. in Europe. "Work has already begun on a long-distance line between Shanghai and Peking that will connect with the toll system now in operation between the northern capital and Tientsin," he said. "The latter line, which has the distinction of being the only inter-city cable now existent in China, is only 100 miles long. The new artery of communication probably will be completed late this year. It will cost about $500,000, and will be constructed according to American standards. The Chinese are great admirers of the telephone. They have become tired of the difficulties which beset their use of the telegraph, where the many characters of their alphabet force them to send all their messages in code, and want to enjoy the time-saving methods. Consequently new exchanges are being erected in most of the larger cities to augment the 55,000 subscribers' lines already in use in the republic. Girls are being trained as operators in Shanghai for the first time. Hitherto, on account of the cheapness of male labour, all work at the Chinese exchanges has been done by men. In the three years since its organisation the China Electric Co., which really is a joint undertaking of the International Western Electric Co. and the Ministry of Communications at Peking, has raised its capitalisation from $250,000 to $1,000,000, a growth fostered by the increasing demand for telephones and other electrical material in the republic."—*Electrical Review*, Chicago.

Italy.—New Wireless Station.—There has been formed at Fiume a joint stock company with the object of erecting and working a large wireless station there. The new company has no connection with the local Marconi Co., but is locally formed and managed, one-third of the capital being reserved for private subscription and 25 per cent. for the Commune of Fiume. The style of the company is the Società Fiumana delle Radio-communicazioni.

London.—New Waterloo Switchboard.—In the September issue of the *South-Western Railway Magazine*, Mr. W. J. Thorrowgood, M.I.E.E., describes the new automatic telephone switchboard recently installed at Waterloo (L. & S.W. Railway). This is a 50-line board capable of dealing with all the telephone business of the offices of the Superintendent of the Line and the London District Superintendent, and it is the first of its kind to be installed on a British railway. To make it easy for the operator on the manual switchboard to quickly determine which jack she has to plug into, it is being arranged to prefix the number ascribed to each office connected to the automatic switchboard with the letter A; thus the telephone number of No. 20 on the automatic switchboard at Waterloo will appear in the company's telephone directory as Waterloo A 20. Hence No. 61 will ask the operator on the manual switchboard after he has removed the receiver from the hook of his telephone instrument for "A 20." The operator will then connect No. 61 on the manual board direct through to No. 20 on the automatic switchboard without in any way interfering with the automatic portion of this board, the operations being practically similar to those on the manual switchboard at present. This has been arranged to save time in switching through at the switchboard and incidentally to give a quick service.

Storm Damage.—The telegraph department of the General Post Office announces that the gale of Saturday night caused considerable dislocation of telegraphic traffic. The dislocation was most pronounced in the Eastern Counties. There apparently the gale had been most severe, wires being down extensively, as the result, it was assumed, of trees being blown across them.

The daily Press also announces that on the following day, Sunday, telegraphic and telephonic lines of communication in Belgium suffered greatly.

France and North Germany also suffered, and on November 7th there was no telegraphic communication between London and Germany, Holland, and Belgium, says the *Evening News*. There were interruptions and delay in the service between London and France, Italy, Switzerland, Russia, and some other countries. The east coast communication suffered more owing to the fact that the main lines on overhead poles were brought down in big bunches all over East Anglia, including all those which connect London and East Walsham, where the cables to Germany and Holland enter the North Sea.

The Times announces that serious delays owing to storms are reported by the Eastern Telegraph Co. from Natal.

The Telephone Service.—The announcement is made that automatic telephones are to be installed at Preston telephone exchange, which now controls over 1,500 local lines.

In reply to a question in the House of Commons last week, the P.M.G. said that contracts were being proceeded with for over 800 miles of main cable. The cables would connect 69 cities and towns with the main underground trunk system, and, in addition, some 500 miles of cable would be laid to connection with the development of the local telephone system.

U.S.A.—New Wireless Station.—President Harding, on November 5th, sent out from the White House the first message to be transmitted by the New York Radio Central on Long Island. Over a land wire connected with the station and looped into the White House, the President dictated his message for wireless transmission. The radio plant occupies a tract of ten square miles, and with its ten units in full operation will utilise a transmitting power of 2,000 kW.—*Reuter's Trade Service* (New York).

New Cable.—Arrangements have been completed, says a Washington message to *The Times*, for the opening of the Yap-Guam cable during the Armaments Conference.

The agreement will be signed by the United States and Japan and approved by Great Britain, France, and Italy probably next week.—*Reuter's Trade Service* (Washington).

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Melbourne.—City Council. February 20th. One 2,000-kW rotary converter with transformer, also 6,600-V, 50-cycle, 3-phase switchgear.—*Reuter's Trade Service* (Melbourne).

January 17th. P.M.G.'s Department. Telegraph instruments, galvanometers, keys, relays, sounders, &c. (Schedule 1718.)*

January 4th. Victorian Government Railways. One set pyrometer equipment (cont. 34,705), electrical equipment for cargo shifter (cont. 34,723), electric rivet heater and accessories (cont. 34,735).*

Adelaide.—January 4th. P.M.G.'s Department. Telephone apparatus and material, including cords, hand sets, supervisory lamps, plugs, jacks, &c. (Schedule No. 604.)

Sydney.—April 24th, 1922. City Council. One 10,000-kW turbo-alternator and two 2,000-kW rotary converters.—*Reuter's Trade Service* (Melbourne).

February 22nd. N.S.W. Government Railways and Tramways Department. One 5,000-kW, 50-cycle turbo-alternator, with condenser and accessories, for the Newcastle power house.*

Brisbane.—February 10th. City Electric Light Co., Ltd. Six miles of 3-core, 0.15-in., paper-insulated cable.*

Victoria.—January 4th, 1922. Railway Commissioners. Five electric road trucks.—*Reuter's Trade Service* (Melbourne).

Argentina.—Buenos Aires.—January 19th, 1922. Board of Sanitary Works. Plant and accessories for a new generating station, comprising three four-cycle Diesel engines of 375 h.p., and three 3-phase alternators each of 250 kW, 2,200 V, 50 cycles.*

Bentley-with-Arksey (near Doncaster).—November 16th. Urban District Council. Supply of electric lamps. Particulars from the Architect, Council Offices.

Bristol.—November 16th. Board of Guardians. Electric fittings for three or six months. J. Simpson, Clerk to the Board, St. Peter's Hospital.

Bulgaria.—January 10th. Direction of Posts & Telephones. Sixty 50-line telephone exchanges, fifteen 100-line ditto. (See this issue.)

Churchstoke (Mont.).—One 1-kW Lister electric lighting set and battery; wiring the village hall, with distribution boards, fittings and lamps. Specifications (5s.) from Mr. Dervis Ward, Court House.

Dublin.—November 16th. G.N.R. Co. of Ireland. Three months' supply of stores including electrical fittings, lamps, cable, wire, &c. (November 4th.)

November 17th. Electricity Supply Committee. Steel chimney, draught fan and accessories. City Electrical Engineer, Fleet Street, Dublin.

Egypt.—November 15th. Egyptian Postal Administration. Stores for six months, including metal-filament lamps, &c.*

Esthonia.—The municipal authorities of Tartu, a town of 52,000 inhabitants, situated on the river Emmajegi, are inviting offers for the construction of a system of electric tramways in the town. Esthonia Consulate, 25, Rue Saint Thomas, Antwerp.

France.—Paris.—November 20th. Post and telegraph authorities. Installation of electric clocks throughout the Post and Telegraph administration buildings. Direction de l'Exploitation Postale, 103, Rue de Grenelle, Paris.

November 26th. Three lots of 100 each of portable mouthpieces, with sound dampers. Direction de l'Exploitation Télégraphique, 103, Rue de Grenelle.

November 16th. Electric lamps in four lots—76,000, 12,000, 25,000, and 7,000. Etablissement Central du Matérial Spécial du Génie, 39, Rue de Bellechasse.

November 15th.—15,900 metres of telephone cable, rubber, paper, silk, cotton and lead covered. For Rabat, Morocco. Office National du Commerce Extérieur, 22 and 24, Avenue Victor Emmanuel III.

Glasgow.—November 30th. Gas Department. Two electric locomotives to haul 30 tons. (See this issue.)

Greece.—November 15th. Supply and installation of a central telegraph station, with network cables. Ministry of Communications at Athens.

Halifax.—November 15th. Electricians' work in connection with the lighting of the Wesleyan Church, King Cross. Specifications from W. W. Longbottom, architect, 35, Commercial Street, Halifax.

London.—Metropolitan Asylums Board. November 23rd. Installation of electric lighting cables throughout the training ship *Exmouth*, off Grays, Essex. (November 4th.)

Paddington.—November 21st. G.W. Railway. Three months' supply of electric wire and cables, and telegraph instruments, apparatus, and stores. (See this issue.)

Manchester.—November 14th. Public Health Committee. Four-core a.c. cable, switchgear, and electric lighting of portion of Monsall Hospital. Specifications (£1 1s.) from City Architect, Town Hall.

November 22nd. Electricity Department. In connection with Barton Power Station. Contract No. 5. Steelwork, cast-iron work, builders' work, &c., in cable bridge over Bridgwater Canal, at Longford Bridge, Stretford. Mr. F. E. Hughes, secretary, Electricity Department, Town Hall, Manchester.

November 25th. Electricity Committee. Circulating-water flow and level recorders. (See this issue.)

November 16th. Education Committee. Electric lighting installation at the Cavendish, City Road, Burgess Street and Abbott Street Municipal schools. Specifications (2ls.) from the Education Offices, Deansgate, Manchester.

New Zealand.—Wellington.—January 31st. Public Works Tender Board. Two sets 3-phase, 6,600-V automatic oil circuit breakers, four sets disconnector switches, and one 66,000-V air-break, lever-operated switch for main transformer switches, for Lake Coleridge power house.*

Jugo-Slavia.—November 15th. Minister of War and Marine. 1,000 kilometres of field telephone cable.*

Sheffield.—November 26th. Health Committee. Plant and machinery for refuse disposal works, including cranes, switchboard, pumps, &c., steam-driven electrical plant and condensers, motors, and starters, &c. (October 28th.)

Tunbridge Wells.—November 21st. Electricity Supply Department. One wooden cooling tower, cast-iron circulating water piping and valves. (See this issue.)

Wexford.—November 28th. Corporation. Overhead l.p. distribution mains, street lanterns, &c. (See this issue.)

Whitehaven.—December 1st. Electricity Supply Department. Two water-tube boilers with superheaters, economisers, pipework, &c.

* A copy of the specification, &c., can be consulted at the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

CLOSED.

Argentina.—A Government decree has been issued providing for the purchase of a quantity of rolling stock, 17 cranes, and various other materials from German firms to the value of 850,000 pesetas, for use in the port.—*Reuter's Trade Service* (Buenos Aires).

London.—L.C.C.—Highways Committee. H. and l.p. switchgear, for the Holborn and Streatham sub-stations:—

Sprecher & Schuh Co., £13,766.
General Electric Co., Ltd., £14,642.
British Thomson-Houston Co., Ltd., £15,057. Recommended.
Johnson & Phillips, Ltd., £15,113.
Ferguson, Pailin, Ltd., £15,116.
Metropolitan-Vickers Electrical Co., Ltd., £16,418.
A. Reyrolle & Co., Ltd., £16,792.
Park Royal Engineering Co., Ltd., £17,064.
Bertram Thomas, £17,282.
Switchgear & Cowans, Ltd., £17,282.
British Thomson-Houston Co., Ltd. (alternative), £17,525.
Metropolitan-Vickers Electrical Co., Ltd. (alternative), £18,575.
Whipp & Bourne, Ltd., £22,305.

The Committee states that the lowest tender is not in accordance with the specification, and is advised that the switchgear offer by the British Thomson-Houston Co., Ltd., is most suitable for the Council's requirements. The company is at present supplying the rotary converters for the sub-stations, and it will be an advantage to have one contractor responsible for the complete erection of the sub-station plant, thus minimising the difficulties of keeping the existing plant running during the work of reconstruction.

Mexborough.—Seventeen tenders were submitted to the Urban Council for the electrical wiring material required for its housing scheme, it having been arranged that the actual wiring was to be done by the Council's own workmen. After the electrical engineer, Mr. J. B. Feltham, A.M.I.E.E., had inspected and reported upon various wiring jobs, it was decided to place the order with Messrs. Mylan & Smith, Ltd., of Sheffield, for J. & P. wiring system cable and fittings.

Peterborough.—Town Council. Accepted:—
C. Beeby, for 600 tons of coal for the electricity works, at 33s. 2d. per ton.

FORTHCOMING EVENTS.

Physical Society of London.—Friday, November 11th. At the Imperial College, South Kensington, S.W. At 5 p.m. Presidential address by Sir W. Bragg, F.R.S.

Junior Institution of Engineers.—Friday, November 11th. At the Caxton Hall, S.W. At 8 p.m. Questions and geenra' discussion evening.
Friday, November 18th. At 7 p.m. Annual general meeting.
(Midland Section).—Friday, November 18th. At the Birmingham Chamber of Commerce. At 7 p.m. Lecture on "Coal Mining in Great Britain," by Prof. K. N. Moss.

Electro-Harmonic Society. Friday, November 11th. At the Grand Hall, Cannon Street Hotel, E.C. At 8 p.m. Ladies' night.

Chief Technical Assistants' Association.—Saturday, November 12th. At the Engineers' Club, London. At 3 p.m. Discussion on Major G. Ewer's paper on "The Sales Department."

Salford Technical and Engineering Association.—Saturday, November 12th. At the Royal Technical College. At 7 p.m. Members' short papers.

Association of Engineers-in-Charge.—Saturday, November 12th. At the Holborn Restaurant. Ladies' night—dinner and dance.

Birmingham and District Electric Club.—Saturday, November 12th. At the Grand Hotel. At 7 p.m. Paper on "The Gyroscopic Compass," by Mr. H. F. Steventon.

Institution of Civil Engineers.—Tuesday, November 15th. At the Institution, Great George Street, S.W. At 6 p.m. Paper on "The Indian Railway Gauge Problem," by Mr. F. G. Royal-Dawson.

Illuminating Engineering Society.—Tuesday, November 15th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 8 p.m. Reports on progress during the vacation and developments in gas lamps and electric lamps and lighting appliances.

Northampton Engineering College Engineering Society.—Tuesday, November 15th. At St. John Street, Clerkenwell, E.C. At 5.30 p.m. Paper on "Breaking Down Ammunition in France," by Mr. F. N. Pickett.

Industrial League and Council.—Wednesday, November 16th. At the Caxton Hall, Victoria Street, S.W. Annual general meeting; lecture on "The Great Essential in Industry," by Mr. F. S. Button.

Paisley Association of Electrical Engineers.—Wednesday, November 16th. At the Y.M.C.A. Buildings, 25, High Street, Paisley. At 7.30 p.m. Paper on "Costing," by Mr. J. D. Ross.

Chelmsford Engineering Society.—Thursday, November 17th. At the East Anglian Institute of Agriculture. At 7 p.m. Paper on "Poulsen Arcs as Applied to Wireless Telegraphy," by Mr. C. W. Boyle.

Manchester Wireless Society.—Thursday, November 17th. At the Albion Hotel, Piccadilly, Manchester. At 8 p.m. Annual general meeting.

Chemical Society.—Thursday, November 17th. At Burlington House, Piccadilly, W. At 8 p.m. Ordinary scientific meeting.

Institution of Electrical Engineers.—Thursday, November 17th. At the Institution, Victoria Embankment, W.C. At 5.45 p.m. Special general meeting. At 6 p.m. Paper on "Telephone Line Work in the United States," by Mr. E. S. Byng.

(North-Eastern Centre).—Monday, November 14th. At the Armstrong College, Newcastle. At 7.15 p.m. Paper on "Telephone Line Work in the United States," by Mr. E. S. Byng.

(North-Midland Centre).—Tuesday, November 15th. At the Hotel Metropole, Leeds. At 7 p.m. Chairman's (Mr. W. E. Burnand) address and smoking concert.

(North-Western Centre).—Tuesday, November 15th. At the Engineers' Club, Manchester. At 7 p.m. Chairman's (Alderman W. Walker) address.

(South-Midland Centre, Students' Section).—Tuesday, November 15th. At the University, Birmingham. At 7.30 p.m. Paper on "The Testing of Materials used in the Manufacture of Electrical Machinery," by Mr. C. Dawson.

(Liverpool Students' Sub-Centre).—Thursday, November 17th. At the University, Liverpool. At 7 p.m. Informal discussion on "The Relative Merits of Direct and Alternating Current in their Application to Industry."

(London Students' Section).—Friday, November 18th. At the Institution, Victoria Embankment, S.W.1. At 7 p.m. Paper on "Modern Hydro-electric Practice," by Mr. E. E. Butten.

Institution of Mechanical Engineers.—Friday, November 18th. At the Institution, Storey's Gate. At 6 p.m. Paper on "The Machinery of Floating Docks," by Dr. E. H. Salmon.

British Electrical Development Association.—Friday, November 18th. At the Institute of Patent Agents, Staple Inn Buildings, W.C. At 8 p.m. Paper on "Salesmanship in Wiring and Installation Work," by Mr. E. H. Freeman.

Diesel Engine Users' Association.—Friday, November 18th. At the Institution of Electrical Engineers, Victoria Embankment, S.W. Discussion on "Some Recent Developments in Mechanical Injection Oil Engines Using Heavy Oils."

Public Works, Roads, and Transport Congress and Exhibition.—Friday, November 18th to November 25th. At the Royal Agricultural Hall, Islington, N.

NOTES.

Educational.—University of Bristol.—A 48-page set of photogravures, forming a pictorial record of the activities of the University, has just been published. It is believed to be the first production of its kind, and it certainly conveys a better idea of all sides of the institution—educational, recreational, and social—than the usual "calendar." Accompanying this is an appeal for funds whereby it is hoped to raise a million pounds, which is necessary if the University is to carry on and expand as it should. The appeal is illustrated by two Raemaekers drawings.

Domestic Efficiency.—The discovery that a great deal of the labour entailed in the running of a home is superfluous appears to be of quite recent date. A correct study of the possibilities with regard to the elimination of this superfluous work leads inevitably to electricity as a means to the desired end. This is not the result of researches on the part of electrical engineers, which are liable to lack the "human" value, but the conclusion arrived at by an expert in domestic science. Consequently, in an exposition organised by Miss Mary Gwynne Howell to point the way to domestic efficiency, electricity plays a considerable part. Miss Gwynne Howell, who is a contributor to our pages, holds no brief for electricity as electricity. She is an investigator into the means for lighting the housewife's burden, and as such has had to acknowledge the pre-eminence of electricity as an agent for accomplishing a variety of household tasks. The exhibition mentioned includes cooking, washing, cleaning, and heating appliances, and Miss Gwynne Howell is able to explain all these to her visitors from the point of view which counts—the user's. In fact, this lady may be called a "consulting domestic engineer," and her efforts will surely do more towards the popularisation of electrical methods than the cold, hard facts of the salesman, which, although true (generally), lack the force of actual experience.

Irish Water Power.—At a recent All-Ireland Industrial Conference, in Dublin, Mr. T. Tomlinson, B.A., B.A.I., read a paper on "Economic Production of Power for Irish Industries." He said the estimated available energy in the country was five times that at present developed from imported coal, and perhaps more. The Irish Commissioners of the Fuel Research Board had reported that the peat deposits would satisfy the power requirements of the country at the present rate of consumption for more than 250 years; and that period could be prolonged by the use of water power. A small water-power plant at the Salmon Leap on the Liffey delivered electric energy at the city boundary at a cost per unit of 0.3225d., while the present cost per unit delivered at the switchboard in steam stations, for coal only, exceeded one penny. He suggested the institution of an experimental hydro-electric station on the best and most easily exploited fall on one or more of the four main water-powers, supplying therefrom some four or five small towns willing to take bulk supply, feeding into standard systems of distribution.

Prof. P. R. Purcell said in certain industries cheap power was of secondary importance; in others it was vital. Power from the river Shannon and from the Erne might be obtained at an average capital expenditure of £50 per e.h.p. In the case of the Liffey and the Barron, the expenditure would be from £100 to £150.

Mr. L. J. Kettle, city electrical engineer, Dublin, said that the principal trouble about water-power in Ireland was the variable flow of the rivers. Dublin Corporation, anxious to develop the Liffey, had decided to supplement the expert advice of Sir John Griffith by that of a Continental expert on water-power. The Liffey and the Bann would be first exploited. Of course, the Shannon and the Erne had the greater water power, but they had not the population near them.

International Conference on h.p. Transmission Systems.—The Union des Syndicats de l'Electricité, of which Mr. Tribot Laspierre is the general secretary, has invited the following countries to send delegates to a conference to be held at Paris to discuss the various technical problems relating to h.p. transmission systems:—Great Britain, Belgium, Spain, United States, France, Holland, Italy, and Switzerland.

The following delegates have been nominated by the Institution of Electrical Engineers to represent the British interests: Mr. W. B. Woodhouse, Mr. P. V. Hunter, and Mr. E. B. Wedmore.

The various National Electrotechnical Committees of the International Electrotechnical Commission have been asked to assist in making this conference as representative and as successful as possible. The Union des Syndicats de l'Electricité desires it to be known that in addition to the delegates from the different countries specially nominated, the meetings will be open to all engineers who wish to attend. It is proposed that the conference should be divided into three sections, dealing with (1) power-station operation, including sub-stations; (2) construction of lines; and (3) distribution. It is hoped that the delegates from each country will submit papers on the subjects brought forward for discussion.

The meetings will be held at the offices of the Union des Syndicats de l'Electricité, Paris, and will commence on Monday, November 21st next, continuing until Saturday, November 26th. No afternoon meeting will take place on Thursday, November 24th, as the celebrations in honour of Ampère will be held, which will be presided over by the President of the French Republic.

Reports of the conference will be issued in French and English, and interpreters representing seven languages will be present for the purpose of translating, if necessary, the decisions arrived at. A dinner will be offered to the delegates on Thursday, November 24th, at the Palais d'Orsay, and a number of visits and excursions are being arranged, comprising an excursion to the devastated regions in the North of France and a visit to some of the new electrical installations already completed or in course of completion. A detailed programme of the meeting will be supplied free of charge on application to the secretary of the International Electrotechnical Commission, 28, Victoria Street, S.W.1.

Electrical Gas Lighting.—The E.D.A. informs us that a misguided German genius has devised a gas-lighting appliance consisting of a single lead attached to the electrical circuit and a handle with a sparking point. The gas is turned on and the point applied to the burner; an earth return is provided by a bare wire connected to the gas pipe or by the stove itself. As the E.D.A. remarks, "No doubt when used this device does light the gas, but it may do all sorts of other things also." At the same time, we refuse to believe that this is an "electrical development" likely to have any vogue in this country (or any other), and we are therefore not unduly alarmed.

All-Russian Electrical Congress.—On October 9th the eighth All-Russian Electro-Technical Congress was closed. It was the first such congress since the year 1913. We are informed that there were about 1,000 delegates, and 220 reports were submitted.

According to a report which the Congress has presented to the Soviet Government, the electrification of Russia is progressing rapidly. A few months' time will see the completion of the Kashirsky electricity station, of 12,000 kW capacity, in the Moscow district, and it is expected to greatly assist the industries of the capital by placing at their disposal more electricity than was the case before the war. At Petrograd a large station will have been established on the Neva no later than the spring of 1922. In the Don Basin, all the local plant is being united to form a large new station in the centre of the anthra-

cite region. In the Urals a new station is being built at the Kizilovsk coal pits, and at the same time dozens of small installations are being constructed throughout Russia to meet the needs of local agriculturists. According to the *Economic Life*, of Moscow, the Soviet aims at nothing less than the electrification of all Russia.—*Daily Mail.*

Appointments Vacant.—Lectureship in electrical engineering £510), for the Bradford Technical College; telegraph foreman (£440 +), for the Government of Nigeria, Railway Construction Department; cable jointer (87s. 4d.), for the Eccles Corporation Electricity Department. (See our advertisement columns to-day.)

War Memorial at Rugby.—On Saturday, October 29th, at Rugby, Field Marshal Sir William Robertson unveiled the imposing memorial which has been erected near the Brownsover Road entrance to the works of the British Thomson-Houston Co., Ltd., to commemorate the making of the supreme sacrifice by 245 employés of that company in the European war. The ceremony was performed in the presence of between 4,000 and 5,000 persons. Special accommodation was provided for the employés of the company and their relatives, for the guests of the company, and for the discharged soldiers. Useful service in marshalling the crowd was rendered by the B.T.H. Fire Brigade, the B.T.H. Boy Scouts, and the local police. The memorial, which was designed by Sir Edwin Lutyens, R.A., consists of a broken cross on a large circular base. It has been executed in Portland stone and weighs approximately 130 tons. The height of the cross is 24 ft. and the diameter of the base 22 ft. On the front of the cross, facing east, is the inscription: "In memory of the men of The British Thomson-Houston Company, who gave their lives in the Great War." The names of the fallen are inscribed round the base; they include the men from all the English and foreign branches of the company. Mr. H. C. Levis, chairman of the company, called upon Sir Wm. Robertson to unveil the cross, and in doing so Sir William mentioned that 1,795 men from the company's works joined the Services, and the memorial would be an abiding testimony to the patriotic response made to the call of duty by the workers of the company. The Archdeacon of Warwick subsequently dedicated the cross, and six buglers from the Territorial Association at Birmingham sounded the "Last Post."

U.S. Electric Vehicle Market.—Manufacturers of electrically-operated trucks, who exhibited their products at the New York Electrical Show early in October, report gratifying results, both in actual and prospective sales. One company, which manufactures a truck with a locking differential and other new features, headed the list with a total of 12 sales; the buyers were large users of petrol-propelled vehicles, who wanted to make comparisons between the two makes when operating under identical conditions.

Manufacturers of electric passenger cars say that while actual business continues dull, more inquiries have been received.

The Trackless Transportation Co. reports that final tests on its improved type of trolley 'bus were entirely satisfactory. The 'bus, which will be used for demonstration purposes in Detroit, is an adaptation of the electric drive to the standard low-centre-of-gravity petrol 'bus built by the Trackless Corporation. The driving motors and control are placed beneath the hood. The collector consists of a standard United States trolley base, a fourteen-foot Shelby seamless steel trolley pole with a double-contact sliding-type collector head, which is swivelled on the pole and provides sufficient flexibility for making close contact with the overhead wire under all service conditions.

The Packard Motor Co. and the Westinghouse Electric Manufacturing Co. have also developed a railless tramway-'bus; it is electrically driven, and is capable of hauling a maximum of 30 passengers and of attaining a speed of more than 25 miles per hour. Energy for driving the 'bus is furnished by a two-wire trolley circuit, which permits marked freedom in turning to the right or left according to the demands of traffic.—*Reuter's Trade Service* (New York).

A Claim for Siemens German Shares.—On Tuesday last the Anglo-German Mixed Arbitral Tribunal began the hearing of a claim by Mr. Alex. Siemens against Siemens & Halske, of Berlin, for the value of 390 1,000 mark shares in the latter concern (which were valued at £37,464 on August 4th, 1914), and interest at the rate of 5 per cent. thereon, and a sum due by way of dividend on the shares on July 31st, 1914.

The s.s. "Barrabeel."—This large twin-screw passenger steamer, built for the Peninsular and Oriental Steam Navigation Co.'s branch line service, by Messrs. Harland & Wolff, Ltd., was successfully launched on November 3rd at Belfast. The principal dimensions of the vessel are 520 ft. long, 64 ft. broad, 41 ft. deep, with a gross tonnage of about 13,000. The vessel has a very complete electrical installation, consisting of four main generators, in addition to which there is a vertical oil engine driving an emergency dynamo situated well above the water-line. The electrically-operated watertight doors are all controlled from the captain's bridge. Among the other electrically-driven gear are included large forced-draught fans for the boilers, refrigerating fans, and large ventilation fans.

INSTITUTION NOTES.

Institution of Electrical Engineers.—There was a very large attendance at the first meeting of the session on the 3rd inst., when Mr. Ll. B. Atkinson distributed the scholarship cheques and premiums awarded for papers read during the last session. Sir John Snell proposed, and Mr. C. H. Wordingham seconded, a vote of thanks to the retiring president, which was passed with acclamation. Mr. J. S. Highfield then read his presidential address, after which he was accorded a hearty vote of thanks that was proposed by Col. R. E. B. Crompton and seconded by Mr. Ll. B. Atkinson.

It was announced that the Council proposes to keep the Institution Library open on two week-day evenings until 9.30 p.m., or alternatively on one evening during the week and Saturday afternoon till 5 p.m. In order to ascertain which two days are most convenient to members, the library will remain open every evening and also on Saturday afternoons until the end of the year, and a record of the attendance will be kept.

London Students' Section.—The following are the arrangements for the first part of the session:—November 18th, paper on "Modern Hydro-electric Practice," by Mr. E. E. Butten; December 2nd, "Automatic and Semi-automatic Railway Signalling," by Mr. H. S. Petch; January 20th, 1922, "Some Applications of the Thermionic Valve to Telephony," by Mr. L. T. Hinton. Visits arranged for members include the Western Electric Co.'s Works, North Woolwich, the L. and S.W.R. power house, Wimbledon, and the Cosmos Lamp Works, Brimsdown.

North-Western Centre.—Mr. W. Walker is to deliver his address as chairman on November 15th at the Engineers' Club, Manchester. The meeting will be followed by a smoking concert. In response to numerous requests, several informal meetings are to be held during the present session. About £64 has been raised towards the £250 which the Centre wishes to contribute to the Benevolent Fund.

Liverpool Sub-Centre.—The opening meeting was held on November 7th, when Mr. Nisbett delivered his inaugural address. Mr. Nisbett dealt with electric lighting, and the many possibilities of improvement in order to obtain greater efficiency and simplicity in installation and operation. He made a plea for greater consideration of the small consumer by electricity supply engineers. A discussion on the address was opened by Dr. Marchant (who presided in the absence of Mr. Dickinson), followed by Messrs. Welbourn, Clothier, Lang, Malpas, Astley, Blades, Wilson, and Dennis. An abstract of the paper will be given in our next issue.

Western Centre.—The first meeting of the present session was held in Cardiff on November 7th. The retiring chairman (Mr. A. J. Newman) presided over a large attendance. Mr. A. C. MacWhirter was inducted to the chair and delivered his inaugural address. In his address Mr. MacWhirter alluded to the increased activities of the Centre, and submitted figures showing the membership in the South Wales and Bristol and West of England districts, and suggested that the time was now ripe to consider the desirability of separating the Centre, with the Bristol Channel and the river Severn as the dividing line. He admitted that the question of finance presented difficulties, but he considered that any increased expenditure would be adjusted by the revenue from increased membership. Mr. MacWhirter reviewed such topics as industrial relations, commercial development, registration of electrical contractors, apprenticeship training, standardisation, and industrial research. He indicated that employers must be content with reasonable profits, and by wisdom and moderation seek to recapture the loyalty of their workers. The worker, on his part, must get rid of that suspicion of his employer which had recently driven him into short-sighted and perilous courses.

At the close of the address a discussion ensued, to which Messrs. Chamen, Alger, Plevin, Rogers, Newman, Nairn, Burr, Hughes, Morley-New, Stretton, Teasdel, David, S. MacWhirter, Cronin, Evans, and Allen, and Professors Bacon and Knox, contributed.

Informal Meeting.—On Monday last, the first "Informal Meeting" of the session was held, in the tea-room of the Institution, and there was a very good attendance. Mr. J. S. Highfield presided, and opened the discussion on the question "How best to speed-up Electrical Progress." Numerous speakers followed, and the discussion was both informative and suggestive, affording abundant material for thought. Smoking was permitted, and after the opening speech a break was made for refreshments—in fact, the procedure which had proved so successful during previous sessions at another rendezvous was closely adhered to; the usual informalities were observed, with some new ones thrown in, and our misgivings lest the proceedings might become more formal at headquarters happily proved to be unfounded.

Chelmsford Engineering Society.—At a meeting of the Society, Mr. T. Clarkson, M.I.C.E., gave an interesting lecture on "Coke as a Fuel for Commercial Vehicles." After pointing out the desirability of obtaining power from whatever sources occurred naturally in the country in which it was required, Mr. Clarkson gave examples of the use of water, wind, and wood in the various countries where these sources of energy were most easily and cheaply obtainable. He also

spoke about coal and its distillation, alcohol, and petrol. In advocating the use of condensers on steam lorries, the difficulty experienced in extracting the last trace of oil, which became emulsified with the water, and the method of overcoming this by an electrolytic process was dealt with.

Royal Society of Arts.—The following is a synopsis of an address on "Wireless Telegraphy" that was given by Mr. Alan A. Campbell Swinton, F.R.S., Chairman of the Council, at the inaugural meeting of the 168th session of the Royal Society of Arts on November 2nd. Various methods of permanently recording wireless signals were discussed and illustrated, and an account given of how messages sent out from Annapolis and other American stations were photographically recorded in Paris. Experiments were made to demonstrate how wireless messages, both in Morse alphabet and in telephonic speech, could be recorded on a phonograph. For this purpose wireless signals, speech, and music, specially transmitted from distant stations while being made audible to the audience, were phonographically recorded in the lecture hall, being afterwards reproduced for the audience to hear a second time. Wireless messages recorded in this way from Moscow, Berlin, Rome, Madrid, Paris, and other distant places, were also made audible. The phonographic method of recording enables messages that have been transmitted and received at too rapid a rate to be read by ear, to be reproduced at much slower speeds so that they can be readily deciphered. The amplifying and other apparatus used in the experiments was described, and experiments were also made with the new Johnson-Rahbek electrostatic frictional receiving telephone, with which very loud speaking can be obtained.

Receiving from distant wireless stations, such as Nantes and Paris, on a small directional frame aerial situated in the lecture hall was demonstrated and explained, together with a method whereby the absolute direction of the sending station can be located. Means were also indicated whereby the correct time can daily be obtained from Paris by wireless with an accuracy amounting to one two-hundredth of a second, a degree of accuracy that should suffice for most purposes.

Institution of Production Engineers.—At a general meeting of the Institution, to be held at the Institution of Mechanical Engineers on November 25th, Mr. A. F. Guyler will read a paper on "Drawings and Production," illustrated by lantern slides.

Society of Chemical Industry.—The engineering group of the Society held a meeting at Manchester on November 4th, when a paper on "Electrical Precipitation" was read by Dr. H. J. Bush. The paper gave a brief historical account of the origin and progress of the Cottrell electrical precipitation process, and described the fundamental electrical phenomena involved. The bulk of the paper was devoted to examples taken from actual practice, showing the modifications of the original apparatus necessitated by particular conditions. Some important working data were also given. The Group is to hold a meeting on November 22nd at the Institution of Electrical Engineers, when Mr. J. H. West will read a paper on "The Claude Synthetic Ammonia Process and Plant."

The Physical Society.—At the Society's meeting on October 28th, Mr. S. Butterworth, M.Sc., read two papers. The first was entitled "On the Use of Anderson's Bridge for the Measurement of the Variations of the Capacity and Effective Resistance of a Condenser with Frequency." The other, entitled "Notes on Earth Capacity Effects in Alternating-current Bridges," showed that an earth capacity acting at any point in the arm of a bridge might be replaced by two earth-impedances acting at the ends of the arm together with an impedance in series with the arm. By integration the result was extended to small distributed capacities. Two methods were given for the elimination of the error due to the end impedances. Complete elimination could only be obtained by the use of shields connected to the ends of the bridge arm.

A paper entitled "An Automatic Voltage Regulator," by Mr. F. G. H. Lewis, was read by Mr. J. W. T. Walsh, who gave an experimental demonstration. This paper described a method by which automatic voltage regulation to 0.15 per cent. might be obtained for such purposes as the operation of photometric standard lamps on an ordinary outside supply varying by as much as 10 per cent. The lamp was placed across an unbalanced Wheatstone bridge of which two opposite arms were composed of tungsten filament lamps. The increase of resistance of these lamps, due to the extra current passing through them when the outside voltage rose, caused a shift in the balance of the bridge such that the voltage across the photometer lamp remained unaltered if the values of the resistances in the arms were properly proportioned. The power taken was about 40 times that used in the regulated circuit.

The presidential address is to be delivered by Prof. Sir W. H. Bragg, K.B.E., to-day (Friday) at the Imperial College of Science and Technology.

Birkbeck College.—The first of two free lectures by Prof. Soddy, of Oxford, on "The Bearing of Physical Science on Economics" was given at Birkbeck College yesterday evening.

Cleveland Institution of Engineers.—Mr. R. H. Archer Coulson, of the Skinningrove Iron Co., Ltd., in his presidential address to the Institution at Middlesbrough on November 7th, in urging the need of reliability in works management, said the use of grabs and magnets went a long way towards the reduction of iron and steelworks' costs, and there was no doubt that the future would see the extended use of electric locomotives, the more so as accumulators were becoming more efficient. The possibility of running locomotives for a complete shift on one battery charge was within reasonable distance of attainment, and they could then hope to see the huge delay that now existed in obtaining coal and water, and the loss of heat units due to locomotives standing under steam, done away with.

If all electrical gear was of the simplest and most robust pattern, many stoppages would be avoided, as there was no other class of work where the demand upon it was so great as in an iron and steel works, and nowhere could a single failure dislocate such a large train of work.

Underground cables were a doubtful advantage, and should be avoided as far as possible. There was always the danger of heavy traffic over lines or subsidence due to water and other causes which allowed the cables to sag, and might pull out the joints, but the most serious point was the length of time taken to locate and repair a fault. Overhead cables certainly lent themselves to easy location of faults and repairs.

Using the power house as the centre of distribution had its disadvantages, mainly due to the danger of its becoming unwieldy as the plant grew, and in the event of a fault, it had to be looked for throughout the whole works, whereas with sub-stations a fault was limited to quite a small section, and much valuable time was saved.

For many years it had been the practice to operate auxiliaries electrically, but there were still a few movements which were operated by hydraulic power. Electrical operation gave a 50 per cent. better efficiency than hydraulic, and it was obvious that the latter should be used as little as possible. Delay through blown fuses could be avoided by the use of oil-immersed automatic circuit breakers. When a fuse "blew," a new one was put in, often heavier, without a look round to ascertain the cause of the extra load, and the new fuse would probably blow out before examination had shown the cause. Delay was thereby increased, and possibly a motor was burnt out.

Royal Institution.—This year's Christmas course of juvenile lectures will be delivered by Prof. J. A. Fleming, F.R.S., on "Electric Waves and Wireless Telephony," in the afternoons of December 29th and 31st and January 3rd, 5th, 7th, and 10th.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

On Tuesday evening next the North-Western Centre of the I.E.E. opens the 1921-22 session with an address from the chairman, Mr. W. WALKER. The proceedings will take place at the Engineers' Club in Albert Square, Manchester, and a smoking concert will follow the reading of the address. Mr.

MR. ALDERMAN W. WALKER, OF MANCHESTER.
Chairman of the North-Western Centre of the I.E.E.

Walker is an alderman of Manchester. He is a Lancashire man, having been born at Worsley. He was educated at the Grammar School, Farnworth, Bolton-le-Moors, and afterwards at the technical schools there. He is engaged upon power installations for textile mills, chemical works, grain silos, flour mills, and pneumatic coal-handling plants. He is a director of Messrs. Henry Simon, Ltd., engineers, of Man-

chester, who have works at Stalybridge, near Manchester, at Bredbury, near Stockport, and at Sydney, Australia. His co-director in the business, Mr. E. D. Simon, is the new Lord Mayor of Manchester. Mr. Walker is chairman of the National Joint Industrial Council for the Electricity Supply Industry, and chairman of the National Board for the Electricity Supply Industry. He is, further, a vice-president of the Electrical Development Association. His recreation is mountaineering, which suggests the certainty that he will maintain the proceedings of the North-Western Centre at a very lofty standard of excellence during the session.

Viscount Peel has been appointed Minister of Transport (unpaid) in the place of Sir Eric Geddes (resigned).

Mr. H. K. Beale has been re-elected chairman of the Birmingham Electric Supply Committee.

We are informed by the Federated Malay States Railway at Kuala Lumpur that our notice (Elec. Rev., August 26th, 1921) with reference to the appointment of Mr. Wilfred Evans as head of the electrical department is not correct, as Mr. A. E. A. Ridgway, M.I.E.E., A.M.I.Mech.E., is the head of all the electrical works on the F.M.S. railways.

Mr. W. Green, on retiring from the position of works foreman at Wimbledon Corporation electricity works, after 21 years' service, was presented by the staff and employés with an English lever watch and a gold albert, together with a pair of silver candlesticks for Mrs. Green. The presentation was made by Mr. W. J. Oswald, the chief assistant engineer.

At the annual dinner of the Kent Section of the Electrical Power Engineers' Association, at Maidstone, on Saturday last, Mr. H. Wilson, late mains superintendent at the Maidstone Corporation electricity works, was presented by Mr. F. E. Lewis, on behalf of the members of the Kent Section, with a slide rule and a gold pencil as a slight token of the members' appreciation of the good work Mr. Wilson had carried out during his chairmanship of the Section.

The claim of Mr. A. Eeden Rutherford, formerly chief engineer and manager of the Leith Corporation Electricity Supply Department, against the City of Edinburgh, for compensation for loss of office due to the amalgamation of the Borough of Leith with the City of Edinburgh, has been decided by the arbiter, Mr. Percy Rintoul, C.A., Glasgow. Mr. Rintoul's final award confirms his proposed finding—namely, a payment to Mr. Rutherford of £4,000 with interest from the date of the amalgamation (November 2nd, 1920) and the expenses of, and incidental to, the arbitration.

Obituary.—Mr. Herman Sloog.—We regret to learn of the death of Mr. Herman Sloog, at the age of 37 years. He underwent an operation in a nursing home, and passed away on Friday last. Mr Sloog was a member of the Institution of Electrical Engineers, also M.S.E., and M.Soc.C.E. (France). He was honorary secretary to the British Bureau, Engineering Department, of the Office National des Universitiés et Ecoles Françaises in connection with which the lectures on hydro-electric engineering were arranged at Grenoble for the last summer vacation. He was also hon. secretary of the Groupe Inter-Universitaire Franco-Britannique, and the Société des Ingénieurs Civils de France.

Lieut.-Col. P. G. von Donop.—We regret to state that Lieut.-Col. Pelham George von Donop, late R.E., who was on the staff of the Board of Trade as an Inspecting Officer of Railways from 1899 to 1913 and Chief Inspecting Officer from 1913 to 1916, passed away on November 7th, in London, at the age of 70 years.

Will.—The late Mr. L. B. Schlesinger, banker, who was chairman of various electric lighting and tramway companies (Rhondda, Torquay, Mexborough, and Musselburgh), left £213,203 gross and £165,762 net.

NEW COMPANIES REGISTERED.

Beecroft & Partners, Ltd. (177,682).—Private company. Registered November 4th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers, importers and exporters of and dealers in ferrous and non-ferrous metals, ores, alloys, chemicals, paints, colours and varnishes, oils, greases, laboratory and electrical apparatus, electrical furnaces for the manufacture and treatment of metals, and electrical and mechanical equipment, analytical and metallurgical consultants and engineers, &c. The subscribers (each with one share) are: F. J. Beecroft, Cliffe Field Road, Moorsbrook, Sheffield, foundryman; V. Beecroft, 8, Thirlwell Bank, Sheffield, foundryman. F. J. Beecroft is the first director. Qualification: One share. Registered office: Norfolk House, 36, Cannon Street, Birmingham.

Davis, Hudson & Co., Ltd. (177,588).—Private company. Registered November 1st. Capital, £1,000 in £1 shares. To acquire the business of patentees, manufacturers, and electrical engineers carried on by A. Davies and F. R. Hudson at 178, Victoria Road, Aston, Birmingham. The first directors are: F. R. Hudson, 183, Slade Road, Erdington, Birmingham; Mrs. L. Davis, 96, Wenlock Road, Handsworth, Birmingham. The said F. R. Hudson is managing director and chairman, and may retain office so long as he holds 250 fully-paid shares. Qualification (except life directors): 100 shares. Secretary: F. R. Hudson. Registered office: 178, Victoria Road, Aston, Birmingham.

Scintillating Sign Co., Ltd. (177,642).—Private company. Registered November 3rd. Capital, £4,200 in 4,000 "A" shares of £1 each and 4,000 "B" shares of 1s. each. To carry on the business of exhibitors of electrical and other advertising signs, electrical and other indicators, and electrical contrivances of all kinds for use of advertisement, &c. The subscribers (each with one "A" share) are: E. C. Elsmore, "Arden," Meadway, N.W. 11, director of companies; C. Russell, 221, Hampton Road, Ilford, Essex, secretary. Permanent directors: E. C. Elsmore (chairman), H. S. Coleman, and W. H. Rawling. Secretary: C. Russell. Solicitors: Hutchison and Cuff, 6, Stone Buildings, Lincoln's Inn, W.C.

on at Camp Hill, Birmingham, and to carry on the business of manufacturers of motor accessories, magnetos for use with internal combustion engines, manufacturers of dynamos for lighting, power, and other purposes, manufacturers of motor cars and other vehicles, &c. The subscribers (each with one share) are: A. H. Treloggan, 310, Alcester Road, Moseley, Birmingham, manufacturer; W. L. Sames, 50, Reddings Road, Moseley, Birmingham, manufacturer. The first directors are: A. H. Treloggan (chairman), W. L. Sames, Sarah M. A. Treloggan, E. Treloggan, W. Sames, and H. W. Sames. Registered office: 21, Ombersley Road, Balsall Heath, Birmingham.

Strichen Electrical Supply Co., Ltd. (11,921).—Registered in Edinburgh November 1st. Capital, £5,000 in £1 shares. To carry on the business indicated by the title. The first directors are: G. W. Sleigh, Strichen Mains, Strichen, factor; G. Young, 16, High Street, Strichen, agent; J. Chalmers, Ugiebank, Strichen, retired farmer; J. A. Smith, 1, High Street, Strichen, accountant; G. Gill, 64, High Street, Strichen, merchant; G. Kinghorn, 38, High Street, Strichen, tailor; J. Ritchie, 65, High Street, Strichen, hotel keeper. Minimum cash subscription, 1,000 shares. Qualification: 50 shares. Registered office: 30, Bridge Street, Strichen.

Oerlikon, Ltd., has been registered with a nominal capital of £40,000 in £1,000 shares. The objects are: To carry on the business of electrical, hydraulic, mechanical and general engineers, suppliers of electricity, light, heat, and power, mechanicians, iron and steel founders and workers, copper smelters and workers, &c. The signatories to the memorandum of association (each signing for one share) are: Hans Max Huber, Ossingen, Switzerland, hon. professor, University of Zurich; Samuel Dietrich Schindler, Zurich, Switzerland, manufacturer; Hans Carl Bohn, Kusnacht, Switzerland, D.Ph., University of Zurich; Marie Paul Robert Jourdain, 36, Rue Certainbert, Paris (XVI), engineer; Martin Werner Schindler, 15, Rue de Milan, Paris 9, manufacturer; Frederic Ernest Hirt, 3, Rue Charles Dickens, Paris (XVI), engineer; Gottlieb Wuetrich, 81, Bursors Cross Road, Fulham Road, S.W. 6, engineer. The minimum cash subscription upon which the directors may proceed to allotment is seven shares. The first directors are: Samuel Dietrich Schindler and Martin Werner Schindler. Remuneration as fixed by the company. The registered office is at Oswaldestre House, Norfolk Street, Strand, W.C. 2. The file number is 177,580.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Rhondda Tramway Co., Ltd.—Satisfaction to the extent of £5,900 on October 27th, 1921, of charges dated March 24th, 1911, November 13th, 1912, and March 11th, 1915, securing £250,000.

Wilson Hartnell & Co., Ltd.—Particulars of £4,082 debentures, authorised October 10th, 1921, present issue £3,000; charged on the company's undertaking and property, present and future, including uncalled capital, subject to first mortgage debentures.

Issue on October 18th, 1921, of £1,082 debentures, part of a series already registered.

CITY NOTES.

Amazon Telegraph Co., Ltd.—For the year ended June, 1921, the gross revenue was £63,143, and the working expenses were £35,018. Corporation Profits Tax to June, 1920, required £491, income tax £6,155, debenture interest £10,331, sinking fund £12,428, and the balance is £5,790. This is to be carried forward subject to Corporation Profits Tax. Owing to the continued trade depression in Brazil, and especially in the Amazon Valley, due to the fall in the price of rubber, the receipts have decreased by £21,987. The directors are, in consequence, unable to recommend the payment of a dividend. The s.s. *Viking* returned to Para last December on the completion of her charters to the West India & Panama Telegraph Co. and the Cuba Submarine Telegraph Co. The balance of receipts from these sources has been credited to the expenses of cable steamers. The cost and amount of cable used for repairs were abnormally high, but it is hoped that the expenditure in this respect will be reduced during the current year. All instalments of subsidy from the Brazilian Government have been duly received.

Stock Exchange Notices.—The undermentioned securities have been ordered to be officially quoted:—

South Metropolitan Electric Light and Power Co.—45,000 ordinary shares of £1 each, fully paid, Nos. 120,001 to 150,000 and 400,001 to 415,000; 500 seven per cent. cumulative first preference shares of £1 each, fully paid, Nos. 292,969 to 293,468; 440 six per cent. cumulative second preference shares of £1 each, fully paid, Nos. 395,927 to 396,366; and £84,990 four and a-half per cent. first debenture stock (redeemable).

Calcutta Electric Supply Corporation.—250,000 ordinary shares of £1 each, fully paid, Nos. 550,001 to 800,000.

Metropolitan Electric Supply Co.—£500,000 7½ per cent. extension debenture stock, 1921, fully-paid (scrip certificates to bearer).

Application has been made to the Committee to allow the following to be quoted officially:—

North Metropolitan Electric Power Supply Co.—£228,460 seven and a-half per cent. debenture stock.

Dealings in the following have been specially allowed by the Committee under Rule 148a:—

Hankow Light & Power.—4,000 seven and a-half per cent. cumulative preference shares of £5 each, fully paid, Nos. 1,001 to 8,000.

Lancashire Electric Light and Power.—65,025 new six per cent. (income-tax free up to 6s. in the £) cumulative convertible first preference shares of £1 each, fully paid, Nos. 400,001 to 465,025.

Siemens Brothers, Ltd.—The directors announce an interim dividend on the ordinary shares of 1s. per share (at the rate of 10 per cent. per annum), free of tax, in respect of the half-year ended June 30th.

British Mannesmann Tube Co., Ltd.—Interim dividend on the ordinary shares of 4 per cent., free of tax. The accounts for the year ended June, 1921, are not yet completed, but no further dividend is contemplated by the directors.

Montevideo Telephone Co., Ltd.—The directors report that the net profit for the year ended July 31st was £27,755, plus £11,772 brought forward. After putting £10,000 to reserve, it is proposed to pay a final dividend of 5 per cent., free of tax, making 8 per cent., free of tax, for the year, leaving to be carried forward £12,157. For the previous year the profit on exchange amounted to £11,014, whereas for the year now referred to there was a loss on exchange of £1,007.

STOCKS AND SHARES.

TUESDAY EVENING.

WHENCE all the money comes nowadays which is so eagerly taking up new issues of gilt-edged character is something of a problem in the City. One heavy loan follows another with remarkable rapidity; still more remarkable, however, is the way in which these issues are over-subscribed in the first place, or readily absorbed if they do not go to the public straight away. The reduction in the Bank Rate to 5 per cent. is, of course, a contributory reason in forcing out money from deposit accounts. In point of fact, however, it is not very unusual for the City man to hear it said that, with the world in such a generally unsettled condition, some people prefer to keep their money on deposit, rather than to use it even in the best stocks. Nevertheless, the latter continue to be readily taken, and industrial debentures, as well as trustee stocks, are in brisk demand. The County of London Electric 7 per cent. debenture, for instance, has gone up to 7½ premium, bringing the fully-paid stock to a little over 101. Lancashire Power debenture has risen to 4½ premium, and the Shropshire, Worcestershire and Staffordshire 7½ per cent. debentures, now fully paid, have advanced to 98, which is 1 per cent. premium. Mersey Power debenture is 2¼ premium. General Electric 7 per cent. debenture keeps about 95.

Southland Electric Power 6 per cents., guaranteed by the New Zealand Government, stand at 96¾. Clyde Valley preference remain about their par price. Pearson & Knowles 7½ per cent. debentures, which came out at 97, were left with underwriters to the extent of 52 per cent. The market opened at 2½ discount, but support forthcame, and the price advanced to 1¼ discount.

The railway market is following with close attention the progress of the electrification schemes of the various companies, and the prices of the leading stocks show a noticeable tendency to improve. It is not surprising that such an event as the amalgamation of the North-Western with the Lancashire & Yorkshire should arouse a good deal of interest. The preliminary scheme for bringing this about is to be considered at a meeting on Thursday, November 17th. Underground Electric shares are better. The withdrawal of the L.C.C. proposal for spending five millions on tube railways disposed of whatever nervousness had been felt with regard to this suggestion. But, as already noticed here, people are apprehensive lest the spending of large capital sums, even though the financing may be assisted by the Government, will involve the placing of prior-charge stocks in front of existing securities. The refusal of the Government to promote legislation for "protecting" the London traffic combine against competition for a few years, had no effect upon prices in the market.

Wireless telegraphy has received a powerful advertisement through the opening of the Radio Central New York exchange, which belongs to the Radio Corporation of America, formerly known as the American Marconi Company. The President of the United States dispatched a message of peace all over the world as a send-off to the new installation. This development is probably the reason for the recent buying of Radio ordinary and preferred shares over here, and it has had a sympathetic effect in strengthening the price of the shares of the Marconi company itself. At 1 11/16 they are 1s. higher on the week. Radio Common hardened to 10s. 9d., and the preferred to 10s. 3d.

General Electrics have been down to 13s. 6d.; but recovered to 16s. 9d. upon the completion of a fairly large selling order. The "B" preference rose 1s. to 16s. 6d. Other manufacturing shares are a little irregular. Edisons dropped to 5s. Siemens at 21s. 9d. have recovered from a pound. Henley's at 1⅛ are 1/16 better. Callender's Share and Investment Trust 5 per cent. debenture stock at 85½ is 1 points up. Amongst other debenture stocks, it may be noted that Newcastle-on-Tyne second debenture at 74¾ and South Metropolitan 4½ per cent. debenture at 72¼ are both a point or so to the good. River Plate Electric 5 per cent. debenture stock, for which the company invited tenders at £81 10s., could be sold to-day, Tuesday, at 83¼ in the market. If any of the stockholders offered their debenture to the company at 80½, it may be presumed that they would be frankly told the position of the price in the Stock Exchange.

Electricity supply shares are quiet. Bromptons have recovered their previous fall, and are up to 6¾. Metropolitans at 3¾ are ¼ lower. There is not, however, much doing.

Eastern Telegraph ordinary stock at 163¼ is again a point lower, while small falls have occurred in both classes of the Anglo-American Telegraph Co.'s issues. United River Plates are better at 5 9/16.

Brazilian Tractions show a rise of 2½ to 30, more hopeful views being taken of the outlook for the milreis; Brazilian Government bonds are better, and the recent severe slump in Brazilian Railway stocks is being partly recovered. Foreigners, however, as a whole are very quiet. Mexico Tramway bonds both lost a point. There are no changes in Mexican Light & Power issues. British Columbia preferred is ¼ down. The rubber share list is distinctly firmer, owing to a rise in the price of rubber itself, and to optimism engendered by the successful launching of the Rubber Shareholders' Association. Iron, coal and steel shares are also better, because of the indications which accumulate with regard to labour arriving at a frame of mind more amenable to reason in the matter of wages.

The secretary of a well-known company courteously draws attention to an error in the yield on certain shares as worked out in our table. The mistake has been duly rectified, and this gives an opportunity for pointing out that our yield-column is calculated upon the last-paid dividends, as, of course, is bound to be the case. At the same time, the recent experience of so many trading concerns has resulted in reduction of previously-paid dividends, that the conscientious commentator feels misgivings lest the practice may mislead, should the dividends in his table be altered. However, this having been said, the reader is placed *au courant* with the position, and will have the less ground for grievance if expectations, based on previous performance, should suffer disappointment.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1919.	Dividend 1920.	Price Nov. 8, 1921.	Rise or fall.	Yield. £ s. d.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	12	12	6¾	+ ¼	£9 18 0
Charing Cross Ordinary	7	8	4¾	—	9 2 4
do. do. do. 4½ Pref.	4½	4½	3½	—	7 4 4
Chelsea	4	6	3½	—	9 4 8
City of London	13	14	2⅞	—	10 9 6
do. do. 6 per cent. Pref.	6	6	17/8	—	6 17 2
County of London	8	8	8⅞	—	9 10 4
do. do. 6 per cent. Pref.	6	6	7½	—	7 10 0
Kensington Ordinary	7	9	4¾	—	9 14 6
London Electric	2½	2½	1	—	7 10 0
do. do. 6 per cent. Pref.	6	6	8	—	10 0 0
Metropolitan	6	7	5⅞	— ⅛	9 6 8
do. 4½ per cent. Pref.	4½	4½	2½	—	7 13 2
St. James' and Pall Mall	12	12	6⅝	—	9 1 4
South London	6	7	22	—	10 18 2
South Metropolitan Pref.	7	7	15/9	—	8 17 10
Westminster Ordinary	10	10	5½	—	8 13 10
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	83	— 1	7 4 7
do. Def.	1½	1½	17	— ¼	8 16 6
Chile Telephone	6	6	6½	—	6 14 3
Cuba Sub. Ord.	7	7	7	—	10 0 0
Eastern Extension	10	10	16½	—	6 1 0
Eastern Tel. Ord.	10	10	164¼	—	6 1 7
Globe Tel. and T. Ord.	10	10	16½	—	6 1 0
do. do. Pref.	6	6	9½	—	8 9 9
Great Northern Tel.	22	24	24½	—	9 16 0
Indo-European	10	10	80xd	—	8 6 8
Marconi	25	15	1¼	+ 1/16	8 17 10
Oriental Telephone Ord.	12	12	2	—	*6 0 0
United R. Plate Tel.	8	8	5 5/16	+ 1/16	*7 3 10
West India and Panama	Nil	Nil	5/-	—	Nil.
Western Telegraph	10	10	16½	—	*6 1 0
HOME RAILS.					
Central London Ord. Assented	4	4	49½	—	8 1 8
Metropolitan	1½	1½	26½	+1	6 7 8
do. District	Nil	Nil	16	— ½	Nil
Underground Electric Ordinary	Nil	Nil	1¾	+ ¼	Nil
do. do. "A"	Nil	Nil	5/-	+6d.	Nil
do. do. Income	4	2	68½	—	*4 7 4
FOREIGN TRAMS, &c.					
Anglo-Arg. Trams, First Pref.	5½	12½	98	—	10 9 6
do. do. 2nd Pref.	Nil	5½	31¼	—	10 4 8
do. do. 5% Deb.	5	5	83	— ½	7 8 9
Brasil Tractions	Nil	Nil	30	+2½	Nil
British Columbia Elec. Ry. Pfce.	5	5	59	—1	8 9 6
do. do. Preferred	5	93/-	51	— ¼	*9 5 0
do. do. Deferred	8	124/-	82	—	*12 4 0
do. do. Deb.	4½	4½	58½	—1½	7 5 4
Mexico Trams 5 per cent. Bonds	Nil	Nil	66	—1	—
do. 6 per cent. Bonds	Nil	Nil	96	—1	Nil
Mexican Light Common	Nil	Nil	10	—	Nil
do. Pref.	Nil	Nil	25	—	Nil
do. 1st Bonds	Nil	5	52½	—	9 10 6
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	16	3⅞	+ 1/16	6 18 6
British Aluminium Ord.	10	10	19/9	—	—
British Insulated Ord.	15	15	1¼	—	10 0 0
Callenders	15	15	1⅞	—	10 8 8
" 6½ Pref.	6½	6½	18 9	—	6 14 8
Crompton Ord.	10	10	14 6	—	13 15 10
Edison-Swan	10	—	5/-	—1/3	—
do do. 5 per cent. Deb.	5	5	68	—	7 7 1
Electric Construction	10	10	16/9	—	11 18 10
English Electric	8	8	7 6	—	21 6 8
Do. Pref.	6	6	11 8	—	10 18 4
Gen. Elec. Pref.	6½	6½	16/-	—	7 8 6
do. Ord.	10	10	16/9	+3/-	11 18 10
Henley	15	15	1⅛	+ 1/16	10 18 2
do. 6½ Pref.	6½	6½	9½	—	6 18 6
India-Rubber	—	—	—	—	—
Met.-Vickers Pref.	8	8	31½	—	8 16 8
Siemens Ord.	10	10	21/9	+1/9	*9 10 10
Telegraph Con.	20	20	21½	—	*5 11 9

* Dividends paid free of Income Tax.

ELECTRICITY SUPPLY IN THE UNITED KINGDOM.

REPORT OF THE ELECTRICITY COMMISSIONERS.

(*Concluded from page* 620.)

Consents to Subscriptions to Associations.—The Commissioners during the period ending March 31st, 1921, issued consents in respect of the payment of subscriptions to the funds of the following Associations:—

(*a*) British Electrical Development Association (9 Local Authorities).

(*b*) British Engineering Standards Association (3 Local Authorities).

(*c*) Incorporated Municipal Electrical Association (17 Local Authorities).

With regard to the applications respecting the Incorporated Municipal Electrical Association, the consents of the Commissioners also covered the payment of the reasonable expenses of attendance of not more than two representatives of the Local Authorities concerned (one representative to be the electrical engineer or his deputy) at certain meetings of the Association.

The Commissioners have also had under consideration the question of giving their consent to the payment of subscriptions by Local Authority undertakers to the funds of District Joint Industrial Councils formed in connection with the National Joint Industrial Council for the Electricity Supply Industry, which was established with the approval of the Ministry of Labour. Further inquiries into this question were proceeding at the date of the Report.*

Charges for Electricity.—The Minister of Transport is the sanctioning authority for all alterations or modifications in statutory provisions governing methods of charging and the prices to be charged for electricity by authorised undertakers, and a considerable amount of work devolved upon the Commissioners in advising the Minister upon applications made in this connection.

The period covered by the Report has been one of exceptional difficulty to all electricity supply undertakings, as is evidenced by the large number of applications which were made to the Minister of Transport for Orders authorising an increase in maximum prices.

In considering the applications referred to them by the Minister of Transport, the Commissioners at an early stage were confronted with certain questions of policy among the most important of which was the question whether they should advise the Minister to re-allow a minimum quarterly charge in Orders authorising an increase in maximum prices.

Mainly through a non-understanding of the position, many domestic lighting consumers fail to appreciate the intention of, and justification for, a minimum quarterly charge, and regard it as a hardship when required to pay a fixed charge, especially for the two summer quarters, when little or no electricity may have been consumed. The continuance of such a public utility service as electricity supply under the difficult conditions at present obtaining can, however, only be ensured by consumers paying a fair and reasonable price for services rendered, or at their disposal, and by undertakers securing a fair and reasonable return on capital expended under statutory obligation in rendering and making available such services. A statutory minimum quarterly charge provides a means to this end, although not the only means.

After a full review of the present economic position of electricity supply from the standpoint of authorised undertakers and domestic consumers, they recommended the Minister of Transport to re-allow the minimum quarterly charge in Orders authorising increases in maximum prices, such charge to be on the following basis, namely:—

(*a*) In respect of each of the two winter quarters, for any amount up to 15 units, 15 times the authorised maximum price per unit.

(*b*) In respect of each of the two summer quarters, for any amount up to 10 units, 10 times the authorised maximum price per unit.

It should be noted that undertakers are not compelled to require a minimum quarterly charge from their consumers, and it is open to them to refrain from making or to discontinue such charge.

The Commissioners dealt with 200 applications made to the Minister for authority to increase existing statutory maximum prices. In five cases the applications were withdrawn by the applicants. Each application was closely investigated, and all relevant circumstances were taken into consideration. In 182 cases an increase was recommended; eight applications were refused, and five were deferred.

The maxima recommended included one of 1s. 3d., 9 of 1s. 2d., 2 of 1s. 1d., 4 of 1s. 0½d., and 66 of 1s., the remainder ranging from 11d. to 8d.

*The Commissioners, on May 18th, issued their consent under Section 30 to the payment of contributions by Local Authority undertakers out of the revenue of their undertakings towards the expenses of the Electricity Supply Industry District Council (No. 10), Great London area.

Construction of Interim Works.—During the period under review four applications were made to the Minister and were referred by him to the Commissioners for investigation. One related to the Lower Severn Electricity District, in respect of the purchase by the Minister of the existing generating station at Beachley for the purposes of a future Joint Electricity Authority, and the construction by the Minister of main transmission lines from the station to the Forest of Dean, to Gloucester and to the Stroud Valley. This application was ultimately withdrawn.

In the case of the Mid-Lancashire Electricity District, the National Electric Supply Co., Ltd., made application in March, 1920, for the construction by the Minister of an e.h.p. transmission line between Preston and Blackburn, the application being supported by the Corporations. After the Commissioners had investigated the engineering and financial aspects of the application, they recommended the Minister to accede to the application and carry out the works. The parties, however, found themselves unable to give certain guarantees, and the matter was postponed.

The National Electric Supply Co., Ltd., made a second application in July, 1920, for the construction by the Minister of a generating station at a site on the river Ribble. This was refused.

The Conference of the Mersey and West Lancashire Electricity Authorities made application in December, 1920, for the construction by the Minister of a capital station at a site at Riverside on the Mersey (including the acquisition of a site for the station) and also of main transmission lines. The decision of the Commissioners on the schemes dealt with at the Inquiry had not been issued by March 31st.

Overhead Lines and Wayleaves.—Under the provisions of the General and Special Acts or Orders relating to the supply of electricity, the consent of the Minister of Transport is necessary before authorised undertakers may place any electric line above ground, except within premises in the sole occupation or control of the undertakers, and except so much of any service line as is necessarily so placed for the purpose of supply. In cases where the local authorities are not themselves the undertakers, the further consent of such an authority was formerly necessary under the provisions of Section 14 of the Electric Lighting Act, 1882, and Section 10 of the schedule to the Electric Lighting (Clauses) Act, 1899, or corresponding provision in any Special Act or Order. The position, however, has been modified by Section 21 of the Electricity (Supply) Act, 1919, and where the consent of the Minister is obtained the consent of the local authority is not required. The Commissioners have dealt with 34 applications made by authorised undertakers for consent to the erection of overhead lines, and recommended the Minister of Transport to give his consent in each case, subject to power being reserved to review the situation upon the expiration of a period of five years.

Extensions of Time and Revocation of Powers: Compulsory Works.—The Commissioners dealt with 19 applications from authorised undertakers; after a review of the circumstances in each case, they came to the conclusion that extensions of time or postponements of consideration of revocation were justifiable, and recommended the Minister accordingly.

Breaking-up of Streets, &c.—The Commissioners dealt with nine applications and recommended the Minister to give his consent in each case.

Capital Issues.—Under the Public Utility Companies (Capital Issues) Act, 1920, the Minister of Transport may consent to variations in the provisions regulating the raising of capital by companies carrying on statutory electricity undertakings where the powers of raising such capital are regulated by Special Acts. An application for the consent of the Minister under the above-mentioned Act was made by the North Metropolitan Electric Power Supply Co. and was granted.

Private Bills.—During the last session and the present session the Commissioners examined all Private Bills, and in 45 cases in which electricity provisions appeared, advised the Minister in connection with his reports made under Standing Orders.

Borough Extensions: Provisional Orders.—The drafts of 22 Provisional Orders were dealt with, and where necessary the Commissioners suggested to the Minister of Health the insertion of provisions for the protection of the interests of existing electricity undertakers.

Methods of Charging for Electricity.—The Commissioners received representations from the British Electrical Development Association on the subject of the existing statutory provisions governing the methods by which consumers may be charged for electricity. In November, 1920, the Commissioners met a deputation from a Tariff Committee appointed by the Association to discuss the matter in further detail, and proposals involving an amendment of existing legislation were placed before the Commissioners. After consideration of the matter from the points of view of undertakers and consumers, the Commissioners subsequently asked the Association to submit

a fuller statement of their case, with practical examples of the operation of various tariff systems, in accordance with the offer made during the discussion in November.*

Electricity (Supply) Bills.—The Electricity (Supply) Bill, 1920, was introduced into the House of Commons by the Minister of Transport on April 14th, 1920. In December, 1920, he made the following statement in the House with regard to the Bill:—

"When I introduced this Bill in pursuance of the policy of the Government as stated 12 months ago when the House was invited to agree with the Lords' Amendments. I had hoped that it would not be considered by this House to be of an acutely controversial character. As, however, this hope has not been realised, it has not been found possible to give time to its consideration. In the meantime the Electricity Commissioners have been dealing with a mass of preliminary work, and they now advise me that they recognise a general disposition on the part of undertakers and authorities in various parts of the kingdom to co-operate in the promotion of voluntary schemes within the ambit of the Act passed last year. It is not, therefore, immediately necessary to invite Parliament to consider the larger powers which are the subject of the Bill at present upon the Order Paper, though I can give no undertaking that at some future date it may not be so."

A smaller Bill was introduced on the following day and subsequently reintroduced by the Minister on April 12th, 1921, as the Electricity (Supply) Bill, 1921.†

ELECTRICITY IN GASES.

The opening meeting of the North-Eastern Centre of the Institution of Electrical Engineers for the session 1921-22 was held on October 24th, when Prof. W. M. Thornton, O.B.E., D.Sc., delivered his inaugural address upon "Electricity in Gases as a Branch of Engineering." The following is an abstract of the address:—

Fifty years ago Maxwell predicted that research on electricity in gases would be the avenue by which the constitution of matter might be penetrated. This has been wonderfully justified, but we are far from the end. It is easy to utilise molecular energy, to make and unmake molecules; the whole science of chemistry and of organic life depends on the power to do this. There remains the stupendous step of unlocking atoms into their component electrons on an engineering scale, and the still greater feat of untwisting electrons into their mother ether. A loose charged molecule is a possible ion, or moving carrier of electricity. Since molecules of gases are separated more than those of liquids, the phenomena depending on ionisation in gases are, on the whole, simpler than those in liquids. Radiation from flame is by far the most important practical electrical property of gases. Energy is radiated in ether waves whenever an isolated charge, or an atom, a system of both kinds of electrical charges, is accelerated or retarded, as when it is thrown into vibration by high velocity collision. At least a fourth part of the energy of the coal burning in a boiler furnace which reaches the water is transmitted to the heating furnace by electrical radiation from the atoms in flame and incandescent coal. Taking the total boiler power in the world as 50 million horse-power, at least 12 million horse-power is transmitted to the furnace walls by short ether waves, making 300 or more billion oscillations a second from atoms in the furnace acting as electric radiators.

Next in engineering importance to radiation is electric ignition. The phenomena here are of great complexity. Ignition proper is not primarily a thermal process; the gases of the explosive mixture are activated or ionised both positively and negatively by the field across the gap, and are then ready to enter into combination when a molecule of combustible gas collides with one or more of oxygen. The gases must be freshly ionised at a certain critical intensity for combination to follow collision. How to produce this ionised state in the most efficient manner is the problem of the magneto industry. There are three ways in which electrical action on gases may cause ignition, through direct intense ionisation: by collision of electrons with molecules, as in a jump spark: or by ionic emission from arcs or their poles when a circuit is broken, or by thermionic emission from hot wires Of these, the first is the most effective in gases of high inflammability, such as petrol vapour, or coal gas; the second, in poor mixtures such as blast-furnace gas. The last is chiefly considered in its relation to danger of ignition of gases in coal mines.

In the Diesel type of engine there is no direct electrical ignition, but a certain temperature by compression is necessary. Considering all chemical combination as electrical in origin, there are here two possibilities; either that the velocities of high temperature collision are those at which ionisation by collision with electrons can occur: or that at the ignition temperature the energy of atomic collision and vibration is such that intense pulses of ether waves are sent out which ionise the adjacent gas molecules after the manner of X-rays, but more intensely, or that there is some form of thermionic emission from the gas molecules themselves. The absence of influence of magnetic fields on the velocity of transmission of a gaseous explosion favours the second hypothesis.

Ironclad switchgear is an example of precautions taken to avoid flashing over following ionisation in gases. All air is excluded, and in the most modern forms of making contact there is no possibility of live metal coming permanently into contact with air.

When a hot-wire lamp is broken in an explosive gaseous mixture, ignition is possible but not certain. As the temperature of a hot wire placed in an inflammable mixture is raised, nothing happens below 200 deg. Centigrade. At this temperature, far below red heat, a discharge of electrons from the wire begins, for negative electrons are always moving about freely in metals. The gas around the wire is ionised by this high-velocity discharge, and slow chemical combination begins. The temperature of the surface then increases until the gas burns freely in contact with the wire at a white heat without flame. This is the phenomenon of surface combustion, in which the greater part of the energy is in the form of radiation.

The oscillations which can be made to occur in an arc circuit promise to be more far reaching and permanent in radio engineering, for example, than the use of the arc as a source of light except for searchlights. The importance of electrical discharge in high vacua is shown in the development of the X-ray tube and of the triode valve. The triode valve can be made to give continued oscillations at high frequencies, and can, therefore, be used instead of a machine as a generator of waves in radio-telegraphy. As much as five kilowatts has been given out by a single valve, and by coupling valves in parallel large antennæ currents have been obtained.

When electrical discharge takes place in air at atmospheric pressure, not as streaming sparks but as a corona glow, intense ionisation by collision is produced. At low temperatures nitrogen compounds are very little formed, the effect is almost confined to activation of the oxygen, which under the intense electrification appears to break up and recombine to form ozone. This gas is manufactured on an engineering scale for bleaching or preserving foods and oils. It is the negative ionisation which is effective, and when electrical discharge just falls short of the spark stage, it is the oxygen that is ionised first with a negative charge. When streaming sparks pass with more positive ions, nitrogen compounds are formed. This point is of importance in the theory of ignition, and in the protection of high-pressure switchgear from the destructive action of ozone and nitric acid.

The importance of the production of solid nitrogen compounds is recognised in Germany where many thousands of tons are made per year. In Scandinavia the electric arc method has been worked to a high pitch of efficiency. Britain is the last country to place extensive manufacture of nitrates on a sound basis. A plentiful supply of nitrogen for manures, with intensive mechanical cultivation of the ground, more co-operation, in fact, between engineering and agriculture, must come if we are to hold our own under all circumstances of peace and war.

Clouds of smoke can be treated to cause an aggregation and deposit. The essential is a strong electric field sufficient to produce strong clouds of ions, electrons, or charged molecules, and to sweep them into contact with the smoke particles, charging them in turn, and carrying them, still colliding and gathering together, to the separator. The success of such an apparatus depends upon the success of one kind of ion, and in this discharge it is probable that the negative ionic discharge plays the leading part.

The electricity of the atmosphere is by no means negligible in its bearing on engineering operations. The upper layers, ionised by radiation from the sun, form a conducting sheath enveloping the sunny side of the earth. This sheath has great influence on the propagation of electric waves, and on the success of radio-telegraphy and telephony. Electrical phenomena on, or near, the earth's surface are rarely beneficial in an engineering sense. Electric storms are the bane of telegraphists, and in certain parts of the earth, South Africa, for example, they are of sufficient violence to shut down large overhead power systems. To counteract the interference with power supply there is no remedy apart from safety valves for excess pressure surges, and the avoidance, as far as possible, of running power lines through lands having a loose and dusty surface.

The address was illustrated by a series of experiments.

Electro-Harmonic Society.—Mr. J. S. Highfield, the president of the I.E.E., is to take the chair at the concert (ladies' night) to be held this evening at 8 o'clock in the Great Hall of Cannon Street Hotel. The artistes will be:—Miss Winifred Lawson, soprano; Miss Violet Openshaw, contralto; Mr. David Ellis, tenor; Mr. Ivor Foster, baritone; Mr. Jack Salisbury, violinist; Mr. Rupert Hazell, entertainer; Mr. Will Bentley, entertainer; Mr. Bernard Flanders, A.R.A.M., solo pianoforte and accompanist. Members should take particular note that owing to numerous complaints with regard to the reserving of seats, the following new regulation has been instituted and will be brought into force at this concert: "There shall be no admission to the hall before 7.30 p.m., and there shall be no reserving of seats except by occupation."

* The statement was submitted in April and the matter is still under investigation.

† The Bill was withdrawn on August 10th, 1921.

TRADE CONDITIONS IN NEW ZEALAND.

A Promising Market.

The report by H.M. Trade Commissioner in New Zealand (Mr. R. W. Dalton), which has recently been issued by the Department of Overseas Trade, reviews trade conditions in the Dominion up to July this year.

After recalling the circumstances leading to the financial and commercial crisis that the country has suffered—which do not differ substantially from those obtaining in other parts of the world—the report says that a better feeling has been apparent recently owing to slight hardening of some markets for New Zealand produce. In the opinion of Mr. Dalton, New Zealand has been caught only by the tail of the storm which has been felt in its full force in other countries, and it is not unlikely that conditions will now gradually improve. Certain it is that with a country so productive and with conditions so favourable, recuperative powers must be good, and there can be no question that development must proceed. All that is needed is careful handling of a difficult financial situation and a willing effort on the part of the primary producers of the country to meet their own difficulties by better, and therefore more economic, methods of production.

The report deals at some length with the problems which arose through the delivery of goods from abroad, contracted for a long time previously, in excess of consumptive requirements at the time of their arrival. It also discusses the relative responsibility of the different parties for the difficulties which ensued. This it places largely on the shoulders of the New Zealand importers, suggesting at the same time that those who have more recently taken up importing rather than the old-established firms have appeared to overlook certain essential factors of business.

Power of Absorption.

In connection with the whole of the question of over-importing, the Trade Commissioner considers it wonderful how New Zealand has been able to bear the strain and how, generally speaking, traders there, and particularly the old-established traders, have accepted the situation and have stood by their commitments. While there have been some cancellations which were hardly justified, and some refusals to take up goods which were shipped or even actually landed, the general body of old-established importers have honourably fulfilled their engagements.

New Zealand, with a population of little over a million, has accepted goods to the value of over £85,000,000 in seventeen months, while her exports amounted to only £68,000,000 in the same period, and many of these exports were paid for long before the period in which they were shipped. This seems to be sufficient proof of the preparedness of New Zealand merchants to stand up to their contracts, and it is doubtful whether there is any other country in the world which can show such a record.

Actual stocks, however, are not phenomenally great in quantity; it is the value represented, combined with the difficulty of getting financial accommodation, which is causing distress. Stocks are large, of course, but it is only in certain lines that they are really in excess of normal. Consistent efforts are, however, being made to clear them, and all possible reductions are being made.

It is difficult to forecast the future, but, continues the report, it seems certain that before very long there may actually be a shortage of goods in this market.

"There has been very little new buying, particularly in the soft goods trade, since September, 1920. Most ships have been coming out in ballast for some months now, and it is only very occasionally that ships arrive with any quantity of cargo. In view of the distance of New Zealand from the source of supply it takes a considerable time for goods to be received in execution of orders, and if there is a revival in England in the near future, which seems likely, it is not improbable that New Zealand may fairly soon be again in the position of finding it difficult to obtain goods when a demand for them exists."

It may be added that the difficulty of forecast has been increased since Mr. Dalton's report was penned, by the threat to New Zealand wool held out by the Fordney tariff proposals in the United States.

More Publicity Needed.

Mr. Dalton still finds it necessary to allude to the failure of individual firms to keep their agents and prospective customers informed of the industrial situation as it affects them at home. Dissatisfaction has been felt by importers generally in New Zealand concerning the treatment which they have received since the Armistice. Much of this feeling was due to misconception of the position in the United Kingdom consequent on the war. Few people overseas realised the extent of the resultant disorganisation.

A further complaint is in respect to goods which were not up to sample, but here again these instances have been due rather to laxity than to definite intent. In short, it may be said that abnormal conditions explain the whole matter.

Summarising this section of his report, the Trade Commissioner says:—

"The one thing essential now in New Zealand above and beyond all others is the adoption of methods to re-establish confidence in British commercial practice which, in the writer's opinion unjustifiably, has been rudely shaken. General feeling here, both among the general public and on the part of trade, is still strongly in favour of the development of British trade with New Zealand, and all sections of the public are anxious to be convinced that their former faith in British systems of trade need not be revised."

Trading Methods.

The most serious complaint which has been heard in New Zealand, however, is that when the demand from other markets ceased, British firms immediately unloaded on the New Zealand market goods in completion of orders which had been given, in many cases, years before, and in total disregard of ordinary trade customs which had been well understood before the war by firms supplying the New Zealand market. It has even been said frequently that firms in the United Kingdom deliberately waited until prices had reached the peak to deliver these goods, and took care that advice of what they were doing should not reach New Zealand until the goods were actually on the water.

In November of last year, when these complaints began to be rife, the Trade Commissioner issued a long statement which appeared in practically every newspaper in the Dominion explaining his views on the situation with the idea of attempting to remove some of the misconceptions which undoubtedly existed. In this statement he pointed out some of the difficulties which had had to be faced in the United Kingdom since the end of the war, and said that, in view of all the circumstances, it was surprising that British firms had been able to deal with overseas trade at all while faced with such difficulties. He also gave it as his opinion that the fact that large quantities of goods were shipped to this market at peak prices was for the most part merely a coincidence. It would naturally follow that firms in the United Kingdom could not deal with bulk orders with any facility until demand from all markets had eased slightly; this could only be when prices had reached the top; thus it would follow that heavy deliveries of orders booked previously would take place at peak prices.

It seems that this must be the natural and economic conclusion of an abnormal period such as the world has passed through in the last few years. But in the main the Trade Commissioner's case for British firms was based on the assumption that all those firms which had been engaged in export business for years, which would comprise most of the firms trading with this market, would realise that it would be a very foolish policy to endanger their goodwill in overseas markets for the paltry advantage which they could hope to get by doing what it is alleged they have done; this apart entirely from the general principles of honest trading which have always stamped British trade.

Since issuing this statement Mr. Dalton has heard scores of detailed complaints, but has seen no reason materially to change the views which he then expressed.

Hydro-Electric Programme.

As has been anticipated, the Government has continued to attach great importance to an active public works programme, in so far as conditions will permit. Hydro-electric development has, of course, received the foremost place in the order of importance, and considerable strides are being made in order to get under way the Government schemes for both Islands. The three main sources selected for the North Island are at Mangahao in the Wellington district to produce 24,000 h.p., Arapuni in the Auckland district to produce 96,000 h.p., capable of extension to 162,000 h.p., and the intermediate station at Waikaremoana to produce 40,000 h.p., capable of extension to 136,000 h.p. In addition to these, supplementary supplies are to be obtained from smaller stations in certain parts of the Island and from the existing steam services at Auckland and Wellington.

Constructive work is now well in hand at Mangahao, and it is estimated by the Minister for Public Works that the installation should become available in 1923. Work has been started also at Waikaremoana, but owing to doubts having been expressed as to the efficiency of the foundations for the proposed Arapuni dam, the northern part of the scheme is, for the time, delayed.

With regard to the South Island, the system will include the existing power station at Lake Coleridge, the Dunedin City Council's plant at Waipori Falls and the proposed Southland Electric Power Board's scheme at Lake Monowai. With regard to the latter station, tenders were recently called for and received, but owing to the financial stringency existing it was deemed not desirable to proceed with the full scheme, and no tender was accepted. Surveys will also be made to decide on the most economical sources of power in the Central Otago, and the northern and western districts of the Island.

As regards the station at Lake Coleridge, owing to the heavy demand for electricity, this power house has in the past been running at a higher capacity than that provided for, and plant for an additional 4,000 h.p. is accordingly being provided. It is stated that in 1922 a further 4,000 h.p. will be provided, and that ultimately, by the construction of a new tunnel and pipe line, the capacity of the station will be brought up to about 36,000 h.p. Meanwhile anxiety as to the maintenance of the water level at the intake has been removed by the diversion of the waters of the river Harper into Lake Coleridge.

In January of the present year the Minister for Public Works stated that the money voted for hydro-electric development would be spent to the best advantage of the Dominion as a whole. Meanwhile, and again owing to financial stringency, expenditure on public works has had to be seriously curtailed.

In the Public Works Statement of 1920, the position of the Government with regard to hydro-electric development was definitely laid down. It was stated that the function of the Government would consist essentially in the construction of the main generating stations and the main transmission lines and sub-stations from which the power will be sold in bulk to local distributing authorities. These local Power Boards, as they have been termed, will be responsible for the final distribution of power in the districts.

British Success. In connection with the public works which have been undertaken since the war, it is very encouraging to note the success of British firms in contracts given. The Government of New Zealand is extremely sympathetic towards British interests in such contracts as are to be given, and British firms themselves have shown a strong inclination to do their best to take full advantage of this sympathy. Some very important contracts have been secured by them in the teeth of foreign competition, notably the electrification of the Otira Tunnel, a contract for 45 railway locomotives, a contract for 2,500 railway trucks, a large contract for rails and several smaller contracts of considerable importance.

Latterly the number of contracts let has been limited by the shortage of funds, but it seems not unlikely that when the big contracts for hydro-electric works come forward, British firms will, at least, secure a considerable share of the work.

It is also gratifying to note the sympathy toward British interests which is shown by the various City Corporations and local bodies. In contracts for these authorities, British firms have also been very successful, and it augurs well for the future that they have been able, so soon after the war, to prove their competitive ability.

THE BREWERS' EXHIBITION.

Although electricity enters into every department of modern life, it would not be expected that in a Brewers' Exhibition it would appear to a large extent. Nevertheless, a wide interpretation of the needs of this particular industry permitted a large number of electrical firms to display their products at the recent exhibition at the Agricultural Hall. Of course, the electric motor drive is nowadays taken for granted, but apart from this there were several exhibits of electrical interest.

The Falkirk Iron Co., Ltd., had a large display of cooking and heating apparatus. The chief feature was a large electric range with two ovens, boiling rings, hot-plates, &c., arranged for very comprehensive heat control. A small cooker for use in restaurants was shown, as well as a somewhat similar appliance for domestic use. The last was of a very convenient size for the average family, of strong construction, and with remarkable heat-retaining characteristics. The cooker possessed a one-heat grill, oven, and two boiling plates. The oven was loaded to 2,000 W (3-heat), the grill 1,300 W, and each boiling plate was of the same loading as the grill, making a total of 5.9 kW. In addition to the cooking appliances, a number of electric fires and irons were exhibited. The fires were of sound construction and of plain but attractive appearance.

The Washing-up Machine Co. demonstrated a new dish-washing machine (the "Dreadnought") upon its stand. This machine has a tank divided into three compartments into which a basket is placed which contains the plates and dishes to be washed. The centre of the tank has two rollers running through its length. On either side of the centre is a side tank, in which two fans revolve and force hot water through a narrow entry over the plates, at high pressure, while the rollers slowly rotate the plates, securing an even washing of every surface. The three divisions are respectively for washing, rinsing, and sterilising. The machine is driven by a .5-h.p. motor.

The Hot-point Electric Appliance Co., Ltd., displayed examples of most of its manufactures—kettles, irons, grills, &c., all of very high finish. A convenient appliance shown was the "Handyvac," a small portable suction cleaner and blower which, although very light, gives a high vacuum.

Messrs. Ransomes, Sims & Jefferies, Ltd., had on view a 4-ton "Orwell" electric lorry and a "C" type electric truck capable of dealing with a load of 4,000 lb. and fitted with a 20-cell "Ironclad-Exide" battery.

Messrs. Richard Garrett & Sons, Ltd., and the General Vehicle Co., Ltd., also showed electric vehicles. The former had a 3½-ton vehicle with a platform 11.3 ft. long and 6 ft. wide. The other firm exhibited a lorry, of similar capacity, made for Messrs. Whitbread & Co., to operate within a ten-mile radius.

The Hobart Manufacturing Co., Ltd., displayed and demonstrated a number of machines for use in bakeries and restaurants, in which the drive was provided by a motor incorporated in the design. Among these were dough mixers, coffee mills, potato peelers, meat choppers, loaf moulders, and a silver burnishing machine. These appliances were all of reasonable size and very efficient in working.

Reads Bakers' Machinery, Ltd., had two or three examples of mixing machines. These were fitted with electric motors and operated through a 3-speed drive. The beater or mixing blade has a planetary motion; the speed is controlled by an accessible lever.

Mr. H. C. Slingsby had a stand bearing a number of trucks of various kinds, including small battery trolleys and trucks fitted with electrical elevating gear.

The Turbine Furnace Co., Ltd., displayed the "Turbine" furnace described in the Electrical Review a short time ago.

Messrs. John Thompson (Wolverhamiton), Ltd., exhibited samples and models of steam boilers superheaters, and water-softening plant. The "Thompson" sectional superheater consists of a pair of mild steel cylindrical headers and a group of "U" tubes arranged for easy replacement without total dismantling; they are tested to 350 lb. per sq. in. The "Kennicott" water-softener is fitted with a revolving sludge gear which prevents the accumulation of sludge in the bottom of the softener. The apparatus can be fitted with a feed-water heater to utilise waste heat.

Messrs. J. W. Flower & Co., in addition to an electrically-driven rotary pump and a bottling machine driven by an electric motor, showed an "Eclipse" electro-hydraulic stacking crane similar to that described in our issue of May 27th (p. 676).

Messrs. Barrett & Elers, Ltd., showed a number of samples of moulded insulating material. These included "Belleroid," a non-hygroscopic material suitable for use in temperatures up to 300 deg. F., and practically acid-proof; a low-voltage material with similar heat and acid-proof characteristics known as "Bellerite"; and "Bellerock," a material which is opaque to X-rays, with a specific gravity only one-fifth of that lead. A shield for a Coolidge tube was shown; this was about ¼ in. in thickness, and, it was claimed, formed a complete protection and localised the rays through the aperture.

The exhibition, which closes to-day (Friday) after a week's run, is yet another proof of the ubiquity of electricity.

German Commercial Propaganda in Sweden.—*Nya Dagligt Allehande* learns that the German Aussenhandelsverband plans the establishment of a great propaganda and selling organisation in Sweden, including the formation of a permanent giant exhibition of German goods. No less than 30 different industrial branches representing practically all kinds of production are included in the plan. An attempt is to be made, says the journal, to give the organisation the character of a purely Swedish enterprise.—*Reuter's Trade Service* (Stockholm).

Abnormal Pressure-rise in Transformers.—In a paper published in the I.E.E. *Journal* on "Abnormal pressure rise in transformers and its remedy," Mr. R. Torikai, A.M.I.E.E., explains that in a high-pressure transformer, abnormal potential gradients likely to cause a breakdown appear usually at the foot of the bushing and at the end coils. The author describes briefly a theory which is applicable to both these cases and from which he concludes that these dangers may be due to the incorrect arrangement of electrostatic capacities. Following this theory, he shows that, by properly grading the capacities, it is possible to avoid to a great extent the dangers in both the bushing and the end coils. The correct gradation of the capacities is shown to be as follows:—

1. The shunt capacity (Cs) must be graded so as to increase with the distance from the earthed end of the coil, or from the top of the bushing.
2. The capacity (Cg) to earth, or to the high-pressure conductor, should be graded so as to decrease with the distance.
3. The ratio Cs/Cg should be as great as possible.
4. It is preferable to use a resistance in series with the capacity Cs.

Experiments show that where a transformer is exposed to excessive stress a potential gradient of about 20 times the normal value may occur at the end coil, and this can be reduced to one-third this value by the device proposed. The author's method also prevents breakdowns due to other causes, such as the decrease in the natural frequency of the coil.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The "Brooklite" 1-kW Set.

There are numerous small electric lighting sets upon the market, but many of them are made abroad. Messrs. J. W. Brooke & Co., Ltd., Adrian Works, Lowestoft, have sent us particulars of a set which they are now manufacturing, and which is an addition to the list of British makes. This is the "Brooklite" 1-kW set, illustrated in fig. 1. The engine is a two-stroke, 2-h.p. petrol engine, running at a speed of 900 r.p.m. The engine is direct coupled to a 1-kW shunt wound

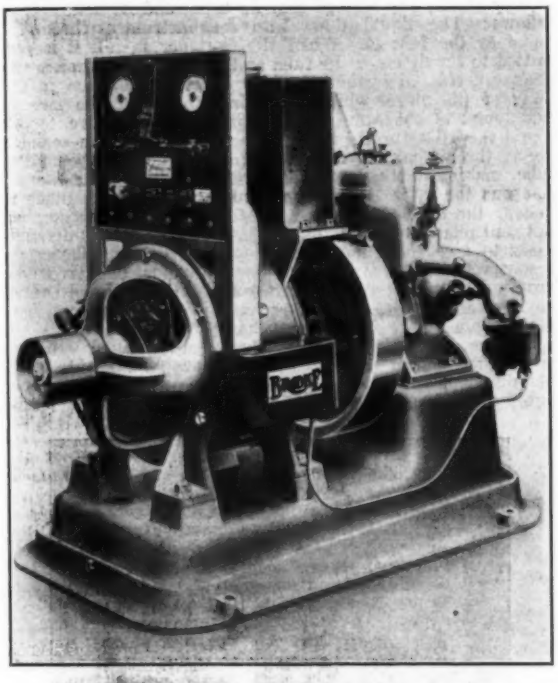


Fig. 1.—The "Brooklite" 1-kW Set.

dynamo through a flexible coupling. The shaft is extended and a pulley mounted on it to enable other plant to be driven direct. The switchboard is of enamelled slate plainly marked with ivorine labels to prevent mistakes in connecting and operating. The battery recommended for this plant, and usually supplied, consists of thirteen cells with a capacity of 180 Ah.

Translucent Plaster Bowls.

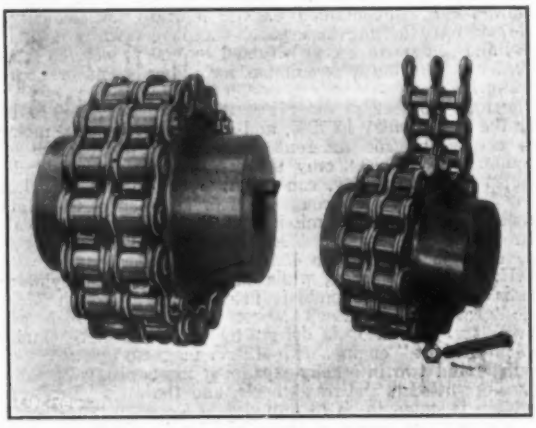
A new departure in electric lighting has been made by the Z Electric Lamp & Supplies Co., Ltd., 73, Newman Street, W. 1, the aim being to provide a bowl fitting with the appearance of carved alabaster without the weight and expense that are usually concomitants of this material. The material used is plaster, which can be moulded to any desired shape or design, rendered translucent by a special process. The casts are reinforced with fabric, and this enables any colour or marble "effect" to be obtained in the process of moulding. The appearance of the bowl when not illuminated is similar to that of pure white marble or alabaster. The bowl retains a sufficient degree of opacity to prevent coloured rays being shed into the room; the result is a white diffused light.

"The Coventry" Chain Coupling.

"The Coventry" chain coupling (fig. 2) has been introduced by The Coventry Chain Co., Ltd., Spon End Works, Coventry, to meet the demands of automobile and general engineers for a positive and flexible coupling constructed for high duty and long life. The unit comprises a standard duplex roller chain, provided with suitable coupling bolts at intervals, and two sprocket wheels, each having a boss on one side only bored to suit the respective shaft diameters. Its design is such that a high factor of safety on the duplex chain is automatically obtained, owing to the stresses being divided equally over the teeth in the coupling flanges or chain sprockets. The coupling is perfectly balanced, being machined all over, is practically indestructible, transmits a large power for its size, and needs no lubrication. It is in no way affected by atmospherical conditions, and the cost of maintenance is practically negligible. The ¾-in. maximum bore coupling will transmit .8 h.p. at 100 r.p.m., and the 5-in. size 180 h.p.

Fig. 3 illustrates the facility with which the two halves of the coupling can be disconnected. The removal of a cotter pin, nut and bolt permits the chain to be wrapped off the coupling easily and quickly. In cases where the coupling is used to operate magnetos and other devices where "setting" is called for, the removal of the chain as indicated above permits of the relative positions of the teeth being modified to give the angular adjustment usually necessary in practice.

The coupling is not designed to replace universal joints where considerable angular motion has to be taken care of,



Figs. 2 and 3.—"The Coventry" Chain Coupling.

but can be fitted where the angular motion does not exceed 2 degrees. The coupling also permits of relative end movement between the two shafts, but this end movement should be limited to an amount equivalent to one-sixteenth of the shaft diameter.

The couplings are stocked in standard sizes from ¾ in. to 3 in. bore, and can be re-bored to suit special requirements up to the maximum bore permissible.

Chain couplings can be manufactured in other sizes to meet special circumstances, and the company is making a speciality of small couplings for operating magnetos.

A "Carron" Grate Suite.

Carron Company, Falkirk, N.B., has put on the market some well-designed electric fires and accessories to conform to the ordinary type of fireplace. Fig. 4 shows one of these suites, which are carried out in any design to harmonise with their surroundings. The one illustrated includes a dog grate

Fig. 4.—A "Carron" Grate Suite.

with an "armour bright" finish, having panels and kerb in the same style and a marble surround, hearth, and appropriate mantel. A number of designs are on view at the company's showrooms, 50, Berners Street, Oxford Street, W.1.

THE INTERNATIONAL MOTOR EXHIBITION.

The "Motor Show," as it is familiarly called, that is being held in London this week is the fifteenth of the series organised by the Society of Motor Manufacturers and Traders, Ltd., in conjunction with the Royal Automobile Club—an annual event which offers an unrivalled opportunity to a large and constantly growing national industry to display its newest products, and supplies the means of calling public attention to the never-ceasing success of research and improvements in craftsmanship.

The holding of the exhibition concurrently at the White City and Olympia was again found to be a necessity. The whole show is international in character (excepting only the products of late enemy countries), and each part is representative of all sections, except that the Motor Boat and Marine Engine Section, which is re-introduced this year as a feature of the annual show, is wholly located at the White City. In this section Messrs. J. W. Brooke & Co., Ltd., exhibit a new 1-kW self-contained electric lighting set, which is described on the previous page, complete with a switchboard and self-starting gear actuated by energy derived from a battery. The outfit is suitable for either yacht or house lighting.

The total number of exhibitors is 571, an increase of 52 over the record entry in 1920, and approximately 1,000 motor cars comprising 151 different makes are available for inspection. Nevertheless, only the cars on two of the stands, both at the White City, can claim to arouse any electrical interest, and that on account of their adoption of the Entz magnetic system of transmission which has been fully dealt with in our pages. The "Magnetic" car (Magnetic Car Co., Ltd.) is driven by a 15.9-h.p., 4-cylinder engine with B.T.H. magneto ignition, while on the 30/50-h.p., 8-cylinder chassis a B.L.I.C. magneto is fitted. The "Crown Magnetic" car (J. L. Crown Motor Co., Ltd.), which was shown last year also, is driven by a 30/50-h.p. 6-cylinder "Silent Knight" engine, with S.E.V. magneto ignition; two magnetic and two internally-expanding mechanically-operated brakes are fitted to the rear wheels, and the car's petrol consumption is stated to be 18 m.p.g.

The accessories section of the exhibition is a large one, and it is here that the electrical gadgets are to be seen. They consist mostly of lighting equipments; engine-starting devices; ignition systems, including many types of magnetos and sparking plugs; accumulators; cable and wire; electric horns, &c.

Messrs. C. A. Vandervell & Co., Ltd., announce that after a long period spent in testing all kinds of anti-dazzle devices submitted to them for motor lamps, they have decided that

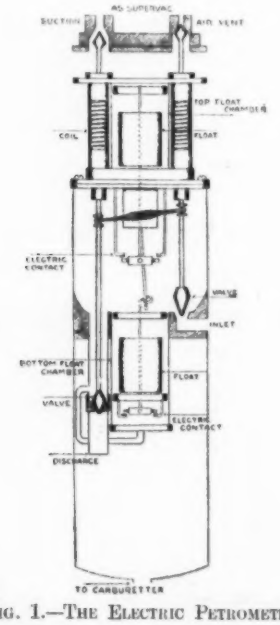


Fig. 1.—The Electric Petrometer.

the one which will meet the requirements, and is nearest to the ideals of the Transport Ministry, is that made under the Grubb patents, which was recently described in our columns. Messrs. Vandervell have therefore arranged to take over the world rights for the manufacture of this lamp, which in future will be known as the "C.A.V. Non-Dazzle Lamp."

Messrs. Rotherham & Sons, Ltd., demonstrate the working principles of the electric petrometer and "super-vac" (Bowden's patent)—an instrument designed for the purpose of measuring and recording with accuracy the volume of liquid flowing through a pipe, or for delivering separate quantities. The instrument, which is illustrated in fig. 1, has been passed by the Board of Trade as a legal measuring device, and is, therefore, the only liquid measuring instrument to be approved by the British Government. It is claimed that the electric petrometer complies with the requirements of the Explosives Department of the Home Office; that the viscosity of the liquid to be measured does not affect its accuracy of working, and that its measurement cannot vary through component parts wearing out—in fact, it has been carried for "thousands of miles" clamped to the handlebar of a motor bicycle.

The instruments can be made for any desired feed, *i.e.*, vacuum, gravity, or pressure; the consumption of electricity is very small; any voltage may be used; and its action is as follows:—The liquid flows into the instrument through a valve at the bottom. When the chamber is full it is permitted to slowly enter the tube at the top where it raises the float and this, in turn, makes the electric connection in the body of the vessel which immediately cuts off the flow of liquid and at the same time opens the outlet valve. The liquid then flows to the desired place, and when the vessel is empty the discharge valve is closed by the float in the bottom tube, making another electric connection which automatically re-opens the inlet valve. These instruments can be made to deliver the smallest quantity up to any desired volume; are not controllable by hand, and it is not possible by any derangement to give short measure. On the registering device for motor vehicles there are two sets of hands, one gives the gross quantity that has passed through and this hand cannot be interfered with. The other hand gives the amount used for either a test or trip and can be re-set at will.

Another interesting device is the Rolph combined tail lamp and traffic warner (Messrs. Allen-Liversidge, Ltd.), which illuminates the number plate, exhibits the regulation red rear light, and enables the driver of the car to signal to traffic

Fig. 2.—The Rolph Traffic Warner.

behind him, as shown in fig. 2. The device is operated mechanically, the signal "slow" being made automatically directly the clutch lever is depressed or the foot brake is applied; the signal "stop" is operated by the hand brake. The direction signals "right" and "left" are shown by arrows, and are operated by a simple lever attached to the steering column. They are not automatic, as the driver's intention to turn has, of course, to be made known some time before the corner is reached.

Another contrivance intended for the same purpose is the "Arrota" signal (Arrota Electrical & Motor Accessories Co., Ltd.), which also attracted attention at the show last year. It consists of three main component parts—arrows at the front and rear of the car and the control mechanism inside it. The driver moves the control handle in the direction in which he wants to go; the arrows are locked in any of their positions, and each time they are moved the electric horn is sounded. The switch that controls the lamps inside the arrows for night work is also carried on the control box.

In conclusion, it might be noted that the Isotta Fraschini car, which comes from Italy, is fitted with a complete electrical equipment from Stuttgart.

"Rocking-horse Power."—Under this title the *Evening News* publishes a *Reuter* message from Quebec announcing the invention of a generator driven by a rocking-horse, which is capable of providing power to a washing machine, sewing machine, or other domestic appliance. The old claim that "A child can work it" would seem very applicable to this idea. On the other hand, if the child discovers that it is doing something useful, it will probably go on strike.

For the benefit of the lay reader, we may add that the idea must not be treated seriously.

WEST RIDING (AIRE AND CALDER) ELECTRICITY DISTRICT.

THE COMMISSIONERS' CONCLUSIONS.

THE Electricity Commissioners have considered the evidence that was given at the Inquiry at Leeds* into (*a*) the schemes submitted respectively by the Conference of West Riding Local Authorities† and the Corporation of Leeds‡; (*b*) the representations made to them by the Yorkshire Electric Power Co.§ and others; and (*c*) the application made by the Power Company for consent to the establishment of a new generating station at Ferrybridge; and have arrived at the following conclusions:—

1. The area provisionally determined‖ is confirmed subject to the inclusion of the urban districts of Hoyland Nether, Wath-upon-Dearne, Bolton-upon-Dearne and Thurnscoe, and the rural district of Riccall.

2. The existing generating stations at Bradford, Halifax, Huddersfield, Keighley, Leeds, Thornhill and Wakefield should be interconnected.

3. The existing generating plant at those stations together with the extensions thereto already authorised by the Commissioners and the addition of another generating set to be accommodated in the Whitehall station of the Corporation of Leeds will, when those stations are interconnected, meet the estimated requirements of the district for several years.

4. The first stage of a new station at Ferrybridge should be constructed forthwith by the Power Company and linked up with the interconnected system above referred to.

5. A second new station is not required at present; matters relating to it should be left to the consideration of the Joint Electricity Authority that is to be established.

6. The negotiations between the Conference of Local Authorities and the Power Company for the sale and purchase of the Company's undertaking having failed, the scheme submitted by the Conference is not feasible. Moreover, the much-needed improvement in the organisation for the supply of electricity in the district should be effected by the co-operation of all the authorised undertakers and authorities in the district under the general control of an authority on which all interests will be represented.

7. A Joint Electricity Authority should, therefore, be formed for the whole district.

8. To ensure the most efficient use of existing generating plant and to avoid unnecessary expenditure on transmission lines, the district should be dealt with in two agreed areas, one being that which can be best supplied from the interconnected existing municipal stations (area "A"), and the remainder should be supplied by the Power Company, provided that all the interconnected stations are worked under one control and for mutual assistance. With regard to area "A," the local authorities concerned and the Power Company should prepare for the approval of the Commissioners a scheme to simplify the position as to rights of supply and transmission or distribution within that area, either by the acquisition on agreed terms of the Power Company's rights of supply in the said area (together with such parts of its transmission system, if any, as have been laid therein at the date of the agreement) or otherwise; and with regard to the remainder of the district the powers of supply of the Joint Authority should be transferred to the Power Company, the latter obtaining such further powers as may be necessary for the foregoing purposes.

9. The Power Company or the Electrical Distribution of Yorkshire, Ltd., as may be determined, should (if they so desire) have conferred upon them, by transfer from the Joint Authority, the distribution rights in all areas within the district which are not at present within the areas of supply of authorised distributors subject (*a*) to the purchase provisions contained in the Electric Lighting Act, 1888; (*b*) to the existing right of local authorities or companies to apply for Special Orders to establish local distribution undertakings, the Power Company giving to such undertakings (if established) any bulk supply required; and (*c*) to a provision enabling a local authority (being an authorised distributor) to purchase such part of the Company's distribution system as may be included in any subsequent extension of that authority's local government boundaries.

The financial arrangements contemplated by the Commissioners are: (*a*) that the moneys for the construction of the Ferrybridge station and of the interconnecting transmission lines therefrom, as well as for the development of the districts outside area "A," will be provided by the Power Company: the Commissioners understand that the Company is prepared to raise these moneys, subject to the necessary powers being obtained, as to which the Commissioners will require to be satisfied in due course; (*b*) that the moneys for the construction of the lines interconnecting the other stations (where not previously raised by the local authorities concerned) and for the construction in due course of a second capital station, will be raised by the Joint Authority. A modified technical scheme for inclusion in the draft Order should be drawn up jointly by the respective engineers for the Leeds and Conference schemes and of the Power Company on the lines herein indicated.

The Electricity Commissioners have accordingly decided to prepare a draft Order establishing a Joint Electricity Authority for the whole district as amended, and providing:—

(*a*) For representation on the Joint Authority (1) of the Corporations of Bradford, Halifax, Huddersfield, and Leeds respectively; (2) jointly of the Corporations of Barnsley, Batley, Brighouse, Dewsbury, Keighley, Morley, Pudsey, Todmorden, and Wakefield, (3) jointly of the Urban District Councils owning undertakings; (4) jointly of local authorities possessing rights of purchase of the undertakings of authorised distributors supplying in their areas, such rights being transferred to the Joint Authority; (5) of the West Riding County Council acting on its own behalf and on behalf of the urban and rural district councils not owning undertakings and in whose districts there are no authorised distributors; (6) of the Power Company; (7) jointly of companies, other than the Power Company, owning authorised undertakings; (8) of the railway companies.

(*b*) For the *administrative* expenses of the Joint Authority not properly chargeable as part of the cost of electricity supplied, or to capital, or not met out of contributions from local authorities or other bodies represented on the Joint Authority, to be met by all the authorised undertakers in the district; and for any excess of expenses of the Joint Authority over its receipts, which may arise from the supply of electricity from the interconnected system, to be met by the authorised distributors connected with the system.

(*c*) For the control by the Joint Authority of the working of the centralised system of interconnected generating stations, such control to be exercised in consultation with an Advisory Committee composed of the engineers of the stations in question; for the pooling of the operating results of the interconnected municipal stations for the common benefit of the local authorities supplied; and for supplies to or from the Power Company's system on agreed terms.

(*d*) For giving effect to the agreed scheme referred to in paragraph (8).

(*e*) For the inclusion of the outlines of the technical scheme to be undertaken by the Joint Authority and the Power Company, with provision that modifications thereof may be made with the approval of the Commissioners.

(*f*) For the Joint Authority acting with the Power Company to submit within two years from the date of the establishment of the Authority, proposals, as laid down in paragraph (9), for a system of distribution in areas within the district which are not at present within the areas of supply of authorised distributors, where there is a reasonable prospect of such supply being remunerative.

(*g*) For the necessary financial powers being conferred on the Joint Authority, subject to the enactment of a further Electricity (Supply) Bill.

Pending the establishment of the Joint Authority, the Commissioners will ask the principal local authority undertakers and the Power Company to form a small Provisional Committee with which the Commissioners may consult from time to time with regard to any development of supply in the district.

* ELEC. REV., May 27th, 1921; p. 697.
† ELEC. REV., March 11th, 1921; p. 324.
‡ ELEC. REV., January 21st, 1921; p. 95.
§ ELEC. REV., March 18th, 1921; p. 361.
‖ ELEC. REV., June 25th, 1920; p. 815.

WATER-POWER IN THE BRITISH EMPIRE.

THE COMMITTEE'S FINAL REPORT.

THE Water Power Committee of the Conjoint Board of Scientific Societies that was appointed in November, 1917, "to report on what is at present being done to ascertain the amount and distribution of water power in the British Empire" issued a preliminary report in July, 1918,* which was followed by a second in March, 1919.† Since then additional information has been obtained, and it is summarised in the present final report; it is hoped to publish shortly a combined edition of the three reports. It will be remembered that the Committee that was appointed by the Board of Trade to investigate the water power resources of the United Kingdom issued its first interim report in 1919,‡ and suggested in its second report, issued in June, 1920,§ machinery for the control of the water resources of Great Britain, including the formation of a Board of Water Commissioners.

The present final report gives additional information relative to various parts of the Empire, and indicates the present state of the investigation work, showing that in Great Britain, India, Canada, New Zealand, Tasmania, and some portions of Australia, more or less adequate steps are being taken by the various Governments, and that definite preliminary steps have been taken in the Union of South Africa, in British East Africa, in Ceylon, in British Guiana and in Egypt. In the remaining countries of the Empire nothing definite is being

* ELEC. REV., August 16th, 1918; p. 151.
† ELEC. REV., August 29th, 1919; p. 264.
‡ ELEC. REV., March 28th, 1919; p. 345.
§ ELEC. REV., July 9th, 1920; p. 58.

done, or appears to be projected, although the potential water-power in New Guinea, Burma, and West Africa, for example, is known to be very large indeed; while where investigation work has been initiated, with the exception of Great Britain, Canada, New Zealand, and possibly India, the scope of the work does not appear to be in any way commensurate with the importance of the subject.

Taking the Empire as a whole, no attempt is being made to ascertain the total resources, to secure any uniformity in methods of investigation and recording of data, to encourage such investigations as are being made, or to collect the information as it becomes available at a central bureau. At present not even an approximately complete inventory exists, much less the practical and commercial information that would assist development of this important national resource.

In calling attention to the active development of water-power resources which has taken place in European countries during the war, as shown in the Committee's second report, a few additional particulars are added, which show that the Empire's position in water-power development at the present time compares unfavourably with that of its commercial competitors. The latest available figures show the following:—

—	Hydraulic horse-power.		Per cent. of available now developed.
	Available.	Developed.	
Europe: Germany, Italy, Switzerland, Spain, Sweden, Austria-Hungary, France and Norway	47,300,000	8,450,000	18·0
United States	32,000,000	6,500,000	20·3
British Empire	60,000,000	3,000,000	5·0

Of the total developed water-power in the British Empire, about 72 per cent. is in Canada.

In its first report, the Committee recommended the formation of an Imperial Water-Power Board, to include a representative of each of the Dominions and Dependencies, and briefly outlined its functions. It now adds suggestions as to the principal objects that the proposed Board should endeavour to carry out:—

It should (in every Dominion and Dependency) ensure comprehensive investigation on a uniform method and system, and secure the initiation of investigations where these are not already in hand. The Board should endeavour to make co-operative arrangements for carrying out investigations in such Dependencies as are not in a position to undertake them unaided.

Arrangements should be made with all oversea authorities for complete copies of all data secured and reports issued to be on file at an Imperial headquarters in London. From these the Board should compile and publish an annual report and detailed annual records of investigations throughout the Empire in a uniform form. The Board should, in fact, be a central clearing house of information on this subject for the whole Empire. It is not suggested that the Board should investigate natural resources other than water-power, but that it should collate brief particulars of such resources locally available, with references as to where fuller information can be obtained.

It should be possible for any capitalist or company needing cheap power in large quantities to ascertain at the offices of the Board, from information immediately available, all the water-powers in certain districts, with the state of investigation for each, in such form that it could be decided which locality and which power appeared sufficiently promising to justify further detailed investigation. For such purposes, whenever possible, investigations of rivers should be carried out with sufficient thoroughness to allow of reasonably close estimates of costs being obtained. These estimates should be made by the engineers of the Government concerned.

The Committee submits that the Conjoint Board of Scientific Societies should urge upon the Government that the creation of an Imperial Water-Power Board, as suggested above, is needed, and that a great impetus would be given to the investigation of water resources in the Dominions and Dependencies by the creation of such a Central Board to assist and to record information for the assistance of commercial investors. An Imperial Water-Power Conference should be convened in London, if feasible, at an early date. The Committee understands that a proposal has been made to hold such a Conference, and that this has been cordially received by the representatives of those of the outlying portions of the Empire, which are most directly concerned. Such a Conference would offer the opportunity of discussing matters of policy, administration, uniformity of investigation and records in connection with water-power development, and could not fail to have a useful effect on such development.

Railway Fusion Scheme.—Proprietors and debenture stock holders of the Lancashire & Yorkshire Railway Co. are to meet on November 17th to consider the scheme that was announced in our columns last March for the amalgamation of the company with the London & North-Western Railway Co.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

Inaugural Address,

By J. S. HIGHFIELD, *President.*

(*Abstract.*)

Under the Council come our Territorial Centres and Sub-Centres, each in a measure autonomous, each depending on, and at the same time strengthening, by direct representation, the central Council. Again, there are the Students' Sections, mainly managing their own affairs. We also have allied to us the Wireless Section and the Society of Radiographers, independent bodies but connected by the closest ties; there are also the important Associations, the Electrical Development Association and the Electrical Research Association, in the formation of which this Institution took a leading part.

These various Centres and Associations, jointly with the Council, form a constitution of proved worth. It is designed, on the one hand, to preserve that continuity of growth based on tradition without which no structure, be it material or spiritual, can hope to attain strength and influence, and, on the other, to bring to bear new energy and new ideas so that yearly its youth may be renewed. The granting of a Royal Charter, together with the very greatest possible honour conferred on us by the King in becoming our Patron, marks, I am sure we all feel, a great step forward. It is the highest public recognition of the work and importance of our Institution. It is also a change which throws on us all an added responsiblity to maintain, to strengthen our position, to enlarge the usefulness of the Institution not only to its members but to the public whom they serve. The circumstances of these latter days have forced on the attention of all the fact that the body politic is not working smoothly. Mr. Atkinson says that discontent exists mainly because the people do not like their work. I agree, but what is the remedy?

Many, perhaps most of us in one sense hate work, but without work we cannot live, and to live it is necessary to do many very dirty and unpleasant jobs. It may be said that a man will do a job if he is well paid for it. That may be, but the pay will not make him enjoy it, and that is the point. One of the first steps necessary to the enjoyment of any work is, I think a personal knowledge of the possession of skill; the greater the knowledge of this skill the greater the pleasure. It has its source probably in a feeling of rivalry, and this sense in its best form is greatly promoted by the national love of playing games, and in sport of every description. There is a splendid sense of pleasure in team work. At least 80 per cent. of the working population must be engaged in manual work, and from the point of view of works production it is clear that the efficiency is highest when the directing and designing staff is as small as possible in proportion to the number of direct producers.

Since the majority of workers must work with their hands, can it be said that our methods of general education are correct? The most proficient hand skill, and the most useful knowledge of some of the difficult industries such as farming, and shipping, and engineering, can only be acquired in boyhood. We have made it imperative that every boy and girl should suffer the generally unpopular operation of having book knowledge forced into them, and we have neglected manual training. Many schools are moving in the opposite direction and are teaching art and hand skill at an early age, but the process should be carried further; but this cannot be done unless the teachers themselves possess the necessary skill.

Every skilled trade is in its nature an art, just as music, painting, and sculpture are arts, and all arts must be practised at an early age. Education, besides assisting in the perfecting of art, must be directed mainly to the formation of character, and continuity of education should be insisted on, so that no student leaves school or college with any other idea except that he leaves with a mental equipment designed for the acquisition of further knowledge. The best of education never can be proved by written examination. In life, knowledge and skill form the spear point; determination, wisdom and character are the shaft which gives the driving power.

My object in enlarging on a subject raised by former presidents is to try and rouse a keener interest in this most important subject among our members. I want, as we all do, to see a greater England, a greater Empire, where every man may have a fair chance not only to benefit himself, but to benefit others, and I hold that to this end the sound and sensible education of youth is of the first importance.

I use the term education to include all up-bringing, the formation of character, the means of health both of body and of mind, the Christian virtues, the love of work, the need of service, and the sacrifice, called duty, that alone should win us rights. These qualities can be won to the full only when there is ordered society, where there is that thing which the framers of the Electricity Act call a margin, and which ordinary men call a profit. Life mainly consists in a hard pull up-stream, but, fortunately, there are softly washed shallows and quiet pools where for a time the struggle ceases. It is in the sunlit shallows and quiet pools that the fish breed, just as in life in the quiet pools of profit, strength, vigour and

new ideas are born that enable the next push forward to be made. Through the war and since, we have all suffered from a spate which washed out the quiet pools and flooded the banks and reduced our river to a cataract. The spate has been followed by a horrid drought with which an engineer finds it still more difficult to deal.

Progress has been rudely interrupted, and it is certain that no rapid remedy is possible; only steady skilled application can produce any result. We know that hard constant work is required to resolve the simplest problem in engineering and science, we know that only sustained effort will produce any lasting result, and that time is requisite. We know that many have not that experience and still believe, about engineering and other matters, in the Fairy Wand by which results are achieved without effort and without time

I am glad to note the important work recently done by electrical firms to better the training of their apprentices and technical assistants, and I think that every engineer in a managing position should do everything he can to assist in the education of his own men and of their sons. Scientific methods should be used. Scientific methods consist mainly in taking precautions against fooling yourself or being fooled, by applying, where possible, steady observation, and deducing by skilled thought true results from the observed phenomena. It will be a great day for our educational systems when the advocates of classical education see eye to eye with the modern side, so that the scientific method may be applied in the widest sense, and on the foundations of past experience be erected a sure knowledge.

I repeat that education should be directed to enabling every boy to acquire skill in a trade, and although the theoretical side of education acquired from books and bookish men is useful, the practical hand-skill, to be acquired only from hand-skilled men, is vital, and the sooner more attention is directed to this side of education the better. One of the nation's most valuable assets is a great body of men skilled in their trades, and taking delight and finding pride in their skill.

There should be due reward for skill and industry. The Trade Unions have done much good for their members, but they have done at least equal harm, not only to their own members, but to the whole nation, by forcing the principle of standard wages and by reducing output. How can any proper man take pleasure in his work under such conditions, and since his life must be passed in work, how can he be happy unless he enjoys it? I hold it right, in a well-conducted State, that everyone should have the opportunity to earn a living, provided he will work, though it must be recognised that this happy state of affairs is one most difficult of attainment. It is only by fortunate environment, steady industry, and thrift among the general population, and good government, beginning in each home, continued by clever management in the factory,and extended by efficient and honest local and national government, that this state of affairs is possible. To complete my happy State, it is also necessary that each man should be willing to help the next, and to rejoice in his good fortune. To attain such success, the spirit of honourable rivalry should have full play, and this cannot be, unless each man is free to work as skilfully and as hard as he desires, and to attain a due reward for his labour.

I have used the term "profit," and I believe the common misuse of the term is responsible for more than half our industrial difficulties. To the individual it is not what he spends on rent, rates and maintenance of himself and his family; it is not the sum he saves for old age or a rainy day, but it is what he can use to serve his desires whether in the form of sport or art, a present to his wife or children, or any other addition to the amenities of life, including the delight of charity. The amounts that may be so spent out of annual income are profit. But there is another sum which I include under the term, and from the industrial point of view a more important one, and that is the sum that each of us can devote to new ventures, including investment in the common stock of companies. All progress in science and engineering depends on the ability of the individual to venture his profit or part of his profit in this way, in applying part of his savings to new ventures.

It is, or should be, clear that national wealth (that is, the wealth belonging to the nation as a whole) is created by individuals and belongs to individuals. We, as electrical engineers, are particularly interested in public companies. It is due to the thrift and enterprise of the shareholders in these companies that there is any electrical business. There is no more democratic institution than a limited company. There is continually at work a compelling influence tending to maintain efficiency of direction and management, and the rough measure is profit. Any sum left over after a dividend is paid on the ordinary shares may be called profit, and in my view it should be employed equally to benefit those who direct and work the business, the shareholders who bear the risk, the consumer by way of a reduction in price, and lastly, some share for the business itself. It is this last portion which can be applied safely for research in new methods and in new ventures, from which arise the means of reducing prices.

Unfortunately, little attention, so far as I have observed, has been given to the importance of profit by electrical engineers. Great attention has been given for years to the reduction of cost, and with excellent results. Almost equal attention has been given to low average prices, but very little to profit, which is really the important matter. When profit is earned, prices can be reduced and, if this is wisely done, the result will be increased profits. The effect is cumulative and leads to expansion of business, with continually decreased prices, because money is easy to raise and, consequently, is cheaply raised. Profit, in short, is the grease which lubricates the wheels of progress; it is the certain sign of successful business. Without profit, if an industry does not die it can live only in a state of suspended animation.

Losses must be faced in any business, and anyone claiming a share of the profit in good times must equally be prepared to share the losses in bad times. The profits, in fact, belong to those who are able and willing to shoulder the losses.

I have spoken mainly of the great business of electricity supply, because I am familiar with its technical and financial aspects, and because it is the foundation on which the whole electrical industry is supported. If electricity supply flourishes, manufacturers of plant, cables, lamps, motors and all necessary apparatus flourish. Electricity helps every manufacturer and trade, and active trade causes a greater use and demand for all means of communication, telegraphs, telephones, railways, and shipping.

The really important matter at the present time is to get on with the work, and since a great part of electricity supply is carried on, and carried on very well, by municipal Corporations and Councils, I want also to say a word about their constitution and methods. The theory of municipal trading is that the citizens should, through their properly elected representatives, provide their own urgent wants. Electricity has been regarded, and rightly so, as a necessity, for although the number of inhabitants directly paying for it may be a moderate proportion only of the population, indirectly, through its use for railways, tramways, driving, factories, and street lighting, the bulk of the population have great interest in securing a cheap and abundant supply. It is claimed for municipal trading that the supply must be more cheaply provided than by companies, for two main reasons: one is that the payment of directors' fees is avoided, the other that money can be more cheaply raised on the credit of the general rate-paying capacity of the whole community than by a company on its own credit, or the credit created by the belief that it can pay and continue to pay dividends.

Doubtless, both contentions are in a measure true; there are no directors' fees, and the rate of interest paid on borrowed money is usually less on municipal loans than on a company's debentures. This, however, is only part of the story; the municipality can borrow money only if it undertakes to repay it by a sinking fund which is an annual sum coming from the pockets of the consumer. It must also provide a reserve, the greater part of which should be used to provide new plant. The sinking fund and reserve are equally direct charges against the revenue, but whereas one continually weakens the cash position, the other strengthens it.

The annual contribution to the sinking fund is money which is paid away to the man who lent the money; the annual contribution to reserve is hard cash with which plant may be bought.

A municipality should create a reserve, and many wisely do so, but the advantage of the low rate of interest on loans is largely wiped out by the annual sums that must be set aside out of revenue for sinking fund and reserve. In fact, for every hundred pounds employed for electricity supply the municipal undertakings have made a charge of nearly 2 per cent. in excess of that made by companies.

In the public services, both company and municipal methods have been employed on a large scale; both have in the main produced excellent results, and both will continue. The company method is, I think, the better because it throws a more severe and direct burden on the shoulders of the management and, consequently, tends to greater efficiency.

I have recited these elementary facts about the finance of enterprise, because failure to realise their importance so often brings the work of the engineer to nought. It is no use devising new machines for saving working costs if the expense of putting them into use results in capital charges that exceed the saving in working expenses. It is no use effecting savings if the results are all given to the public; part should go to the industry, part to those who work, and part to those who venture their savings on its behalf. The fault of misspending the profits is a capital one. In company working, it generally takes the form of paying too high dividends at the expense of reserve, and so the business is starved. In municipal working, it is common to appropriate too large a proportion of the profit to the relief of the rates; it is much better to buy new plant and avoid raising fresh loans, especially at the present time. The Electricity Bill of 1919 originally provided that all savings should enure to the consumers, clear evidence that its framers neither paid attention to business principles nor showed any knowledge of human nature.

(To be concluded.)

Arithmetical Calculating Slips.—Messrs. Bowman and Murdoch, 99, Shoe Lane, E.C.4, have sent us a box of their calculating slips (price 1s.) for carrying out multiplication and division. The slips are, we think, of educational rather than practical value.

NEW PATENTS APPLIED FOR, 1921.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

27,690. "Device for rendering inoperative simultaneously prime movers and brakes of mechanically and electrically-propelled vehicles, &c." E. W. Park and H. Rose. October 18th.
27,692. "Interrupter rheostats." J. P. Aregall. October 18th.
27,763. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co.). October 19th.
27,787. "Means for operating electrical signals, &c." Ges. fur Drahtlose Telegraphie. October 19th. (Germany, October 22nd, 1920.)
27,788. "Telephone systems." J. E. Pollak (Siemens & Halske Akt.-Ges.). October 19th.
27,808. "Electric switch plugs." R. Crust. October 20th.
27,822. "Electric sound producing horns." T. S. Rogers. October 20th.
27,835. "Steam electric plant for production of power." H. H. Bridges. October 20th.
27,843. "Dynamo-electric machines." A. S. Murdoch. October 20th.
27,849. "Electrical transmitter microphones." E. D. Young. October 20th.
27,868. "Carrier telegraph circuits." Western Electric Co., Ltd. October 20th. (United States, October 21st, 1920.)
27,874. "Electrical heating of water, &c." British Generator Co., Ltd., and H. Constable. October 20th.
27,883. "Radio-signalling systems." British Thomson-Houston Co., Ltd. (General Electric Co.). October 20th.
27,884. "Electric discharge apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). October 20th.
27,885. "Automatic electric ship's lead." I. Ben-Ayad. October 20th.
27,889. "Containers for electric secondary batteries." W. R. Bullimore. October 20th.
27,893. "Telephone systems. &c." W. J. D. Godsell. October 20th.
27,901. "Systems of operation for electric locomotives, trams, &c." W. P. Durtnall. October 20th.
27,902. "Switches for train lighting systems." J. Etchells and Vickers. Ltd. October 20th.
27,917. "Condensers." W. J. Alder and Balfour Baring, Ltd. October 20th.
27,934. "Overload trip retarding device for electric circuit breakers, &c." F. W. Close and Electric Construction Co., Ltd. October 21st.
27,937. "Electrical instruments." M. B. Field. October 21st.
27,977. "Incandescent electric lamps." J. Knight. October 21st.
28,016. "Electric railway motor control systems." Metropolitan-Vickers Electrical Co., Ltd. October 21st. (United States, November 5th, 1920.)
28,017. "Electric discharge apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). October 21st.
28,063. "Electric fly and insect killer." H. A. Thomas. October 22nd.
28,074. "Portable electric lamp holders." Cable Accessories Co., Ltd., P. W. Davis, and F. H. Reeves, October 22nd.
28,079. "Apparatus for reproduction by electro-deposition." S. O. Cowper-Coles. October 22nd.
28,087. "Starter, transmission gear, and dynamo drive combined." J. B. Bignamy. October 22nd.
28,089. "Method of electrically welding high-speed steel to tool shanks, &c." E. Schoder. October 22nd.
28,123. "Sparking plug for explosion motors." A. O. M. Lofgren. October 22nd. (Sweden, October 23rd, 1920.)
28,142. "Electric arc welding." B. Turner. October 24th.
28,144. "Electric fuses." W. J. Line and J. H. Tucker & Co., Ltd. October 24th.
28,146. "Electric chronoscope." G. E. Moore. October 24th.
28,160. "Electric wall, &c., plugs." F. D. Denner and L. J. Lepine. October 24th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1919.

20,561. "Electrically heated soldering irons." W. H. Browning. July 16th, 1920. (170,016.)

1920.

9,763. "Electric measuring instrument." E. C. R. Marks (W. G. Nagel Electric Co.). April 7th, 1920. (170,021.)
12,788. "Sparking plugs for internal combustion engines." H. B. Ransom and F. J. S. Thompson. May 8th, 1920. (170,030.)
12,831. "Apparatus for rectifying high and low-frequency alternating currents." J. Nienhold. May 15th, 1917. (142,870.)
15,189. "Electrodes for electric arc welding and like operations." J. Holslag. June 4th, 1920. (170,039.)
15,222. "X-ray plant." G. Hubers. March 27th, 1916. (144,318.)
15,498. "Storage battery plates." J. F. Monnot. June 8th, 1920. (170,043.)
15,590. "Couplings for sparking plug or like terminals." J. I. D. Stevenson and K. D. Stevenson. April 11th, 1921. (170,045.)
15,614. "Induction furnaces having unidirectional circulation." J. R. Wyatt. June 9th, 1920. (170,046.)
15,669. "Signalling circuits particularly applicable to telephony." P. J. Hackett. June 9th, 1920. (170,048.)
15,679. "Electric signalling or control systems." C. L. Walker. June 10th, 1920. (Cognate application 15,692, 1920.) (170,049.)
15,814. "Electric switch automatically operated by heat." A. G. Bullen and R. L. Jenkinson. June 11th, 1920. (170,052.)
15,924. "Primary galvanic batteries and electrodes for such batteries and methods of manufacturing such electrodes." E. W. Jungner. June 17th, 1919. (145,018.)
15,997. "Electricity generating and ignition apparatus for internal combustion engines." W. B. Moses. June 29th, 1917. (144,738.)
18,314. "System for controlling relays by means of wave trains especially for wireless high-speed telegraphy." Siemens & Halske Akt.-Ges. May 27th, 1919. (146,354.)
18,654. "Wireless signalling apparatus." Radio Corporation of America. April 5th, 1915. (146,530.)
18,655. "Thermionic valves for use in wireless signalling apparatus." Radio Corporation of America. April 5th, 1915. (146,531.)
18,660. "Apparatus for radio signalling." Radio Corporation of America. February 1st, 1916. (146,536.)
18,662. "Thermionic vacuum valve devices." Radio Corporation of America. March 10th, 1917. (146,538.)
19,088. "Automatic switch for overhead runway." J. M. Lowe. July 7th, 1920. (170,068.)
19,197. "Electron discharge devices." British Thomson-Houston Co., Ltd. October 29th, 1913. (147,148.)
19,205. "Telephones." G. Seibt. March 1st, 1916. (147,153.)
19,304. "Automatic cut-out for electric motors." Vaile Kimes Co. June 16th, 1915. (147,225.)
19,333. "Wireless telegraph transmission." Ges. fur Drahtlose Telegraphie. December 24th, 1915. (147,430.)
19,348. "Means for signalling to railway trains in motion." Ges. fur Drahtlose Telegraphie. February 4th, 1919. (147,445.)
19,349. "Wireless receivers." Ges. fur Drahtlose Telegraphie. May 21st, 1919. (147,446.)
19,387. "Supports for filaments used in thermionic valves and similar apparatus." A. K. Macrorie, H. Morris-Airey, and S. R. Mullard. July 7th, 1920. (170,072.)
19,573. "Electron discharge apparatus." British Thomson-Houston Co., Ltd. October 16th, 1913. (147,616.)
19,636. "Electric generating systems." Kohler Co. August 20th, 1917. (147,663.)
19,713. "Combined resistance with hollow conductors." F. Jacoviello. December 21st, 1917. (147,718.)
19,800. "Terminal bending tools for armatures." V. G. Apple. December 11th, 1916. (147,772.)
19,807. "Starting and lighting apparatus for self-propelled vehicles." V. G. Apple. April 23rd, 1917. (147,779.)
19,808. "Method of joining separated armature conductors and of making commutators from said conductors." V. G. Apple. February 14th, 1918. (147,780.)
19,817. "Methods of making armatures and armatures produced thereby." V. G. Apple. May 7th, 1918. (147,789.)
19,820. "Tool for bending the terminals of armature conductors." V. G. Apple. December 23rd, 1918. (147,792.)
19,822. "Method of constructing armatures for dynamo electric machines." V. G. Apple. September 15th, 1919. (151,243.)
19,851. "Means for controlling electric currents and potentials by the use of electron discharge apparatus." British Thomson-Houston Co., Ltd. February 5th, 1914. (147,806.)
19,852. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. January 16th, 1917. (147,807.)
19,853. "Electric motors." British Thomson-Houston Co., Ltd. February 14th, 1918. (147,808.)
19,856. "Wireless receiving systems." British Thomson-Houston Co., Ltd. June 15th, 1918. (147,811.)
19,858. "High-frequency alternators." British Thomson-Houston Co., Ltd. September 23rd, 1916. (147,813.)
19,859. "Means for transforming direct current." British Thomson-Houston Co., Ltd. December 29th, 1913. (147,814.)
19,861. "Wireless receiving systems." British Thomson-Houston Co., Ltd. October 11th, 1917. (147,816.)
19,868. "Wireless signalling systems." British Thomson-Houston Co., Ltd. December 29th, 1913. (147,823.)
19,885. "Wireless telephony systems." Soc. Francaise Radio Electrique. February 24th, 1917. (147,836.)
19,903. "Thermionic valve generators." Ges. fur Drahtlose Telegraphie. January 9th, 1918. (147,851.)
20,028. "Airtight metal cap connection for conducting electric current into hollow glass bodies." O. Kruh. July 6th, 1917. (148,127.)
20,032. "Production of metal films particularly for use as electrodes in vacuum electric discharge apparatus." British Thomson-Houston Co., Ltd. June 6th, 1914. (148,130.)
20,090. "Transmitters of high frequency oscillations." Ges. fur Drahtlose Telegraphie. November 6th, 1918. (148,180.)
20,238. "Electric coils for high frequency purposes." Dr. E. F. Huth Ges. November 29th, 1916. (148,324.)
20,248. "Process for the electrolytic production of dense and firmly adhering tin deposits." M. Schlotter. March 15th, 1917. (148,334.)
20,354. "Diaphragm transmitter for subaqueous sound signals." Signal Ges. March 13th, 1915. (Addition to 14,218, 1913.) (148,409.)
20,356. "Transmitting and receiving device for subaqueous sound waves." Signal Ges. April 4th, 1916. (Addition to 147,935.) (148,411.)
20,362. "Sound producers and receivers." Signal Ges. July 31st, 1919. (Addition to 147,939.) (148,759.)
20,369. "Device for ascertaining the direction of sound waves." Signal Ges. May 29th, 1915. (148,422.)
20,375. "Subaqueous sound producers and receivers." Signal Ges. November 5th, 1917. (Addition to 147,939.) (148,428.)
20,376. "Direction finder for sound waves." Signal Ges. July 10th, 1915. (Addition to 148,422.) (148,429.)
20,474. "Portable tool case for adjusting the platinised screws of magnetos for internal combustion engines." M. Sacharelo. October 31st, 1918. (147,586.)
20,493. "Airtight metal cap connection for conducting electric current into hollow glass bodies." O. Kruth. January 15th, 1919. (148,522.)
20,499. "Electric conducting coils." Ges. fur Drahtlose Telegraphie, March 4th, 1918. (Patent of addition not granted.) (148,524.)
20,636. "Coin-freed meter for electricity, gas, water, or the like, provided with a device for making a minimum charge." Allgemeine Electricitats Ges. July 13th, 1917. (148,805.)
20,676. "Dynamo-electric machines." F. H. Schroeder. July 10th, 1920. (170,094.)
20,688. "Production of electric carbons." G. L. Schmidthammer. March 20th, 1918. (148,872.)
20,782. "Thermionic valves." A. K. Macrorie, H. Morris-Airey, G. Shearing, and S. R. Mullard. July 10th, 1920. (170,096.)
20,783. "Use of multiple seals with silica thermionic valves and a method of attaching the conductors from the seals to a valve electrode." A. K. Macrorie, H. Morris-Airey, G. Shearing, and S. R. Mullard. July 10th, 1920. (170,097.)
20,835. "Device for maintaining the pitch of the sound constant in sound transmitting installations." Signal Ges. October 1st, 1917. (148,975.)
20,838. "Electro-magnetic submarine sound-signalling apparatus." Signal Ges. November 1st, 1918. (148,978.)
20,839. "Electro-magnetic sound transmitting and receiving apparatus with two exciting windings." Signal Ges. November 18th, 1918. (148,979.)
21,202. "Appliance or instrument for testing magnetos and sparking plugs in actual use." E. R. Gardner. July 14th, 1920. (170,112.)
21,298. "Electric lighting apparatus for road vehicles, more particularly motor cycles and the like." S. G. Muir and G. A. Mathys. July 14th, 1920. (Cognate application 29,318, 1920.) (170,113.)
21,304. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and F. P. Whitaker. July 14th, 1920. (170,114.)
21,504. "Electric circuit closers." E. F. Nichols July 16th, 1920. (170,117.)
23,109. "Continuous wave telephony and telegraphy." C. S. Franklin. August 5th, 1920. (170,154.)
23,783. "Means for use in the testing of internal combustion engine ignition apparatus as employed on motor vehicles and for remagnetising the permanent magnets of such apparatus." H. Bailey and A. C. Pritchard. August 14th, 1920. (170,158.)
24,416. "Apparatus for indicating the reception of sound, light, heat, or electricity." J. Robinson and H. L. Crowther. August 23rd, 1920. (170,170.)
25,545. "Electric regulating systems." British Thomson-Houston Co., Ltd. (General Electric Co.). September 4th, 1920. (170,180.)
27,393. "Amplifiers for sound reproducing machines." J. W. Booth. September 27th, 1920. (170,190.)
27,873. "Method of spectrum analysis of Rontgen rays and apparatus therefor." K. Staunig, O. Fritz, and A. March. October 1st, 1920. (170,191.)
31,230. "Electrical quick-acting step regulator." E. Dick. November 4th, 1920. (170,207.)

1921.

1,104. "Device for increasing the sound energy with submarine sound transmitters." Signal Ges. October 2nd, 1915. (157,230.)
5,347. "Electric switches." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). February 16th, 1921. (170,237.)
9,388. "Electric switching or like devices." A. Sen Cohn (firm of). April 23rd, 1919. (Divided application on 147,940.) (160,813.)
11,473. "Electric fire, burglar, and like alarms." Bayerische Vereinsbank. April 20th, 1920. (161,983.)
12,642. "Electrical controllers." Metropolitan-Vickers Electrical Co., Ltd. May 17th, 1920. (163,298.)
13,621. "Process for obtaining deposits of iron by electrolysis." Soc. d'Electro-Chimie et d'Electro Metallurgie. June 9th, 1920. (164,725.)
13,815. "Process and apparatus for connecting additional transformers to a supply circuit." Siemens Schuckertwerke Ges. May 14th, 1920. (163,324.)
17,844. "Protective apparatus for electrical systems." Metropolitan-Vickers Electrical Co., Ltd. September 8th, 1920. (168,860.)